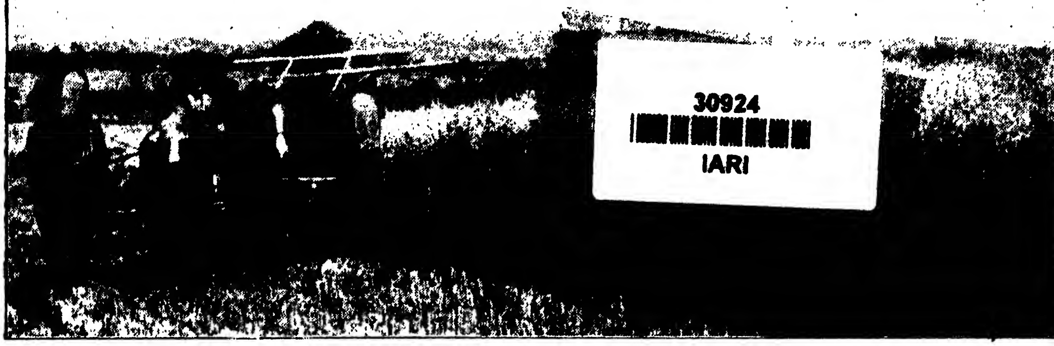
The Agricultural Gazette of New South Wales



GOOD WISHES FOR 1948.

A Message from Hon. E. H. Graham, M.L.A.,

Minister for Agriculture.

TO the primary producers of New South Wales I extend every good wish for 1948, which I trust will prove to be a year of bounteous yields and remunerative returns.

Hon. E. H. Graham, M.L.A.,
Minister for Agriculture.

It is particularly gratifying to note as a sign of the times, that at long last the important role played by the primary producer in the world's economy is being universally recognised, and that with such recognition has come the realisation that he is entitled to receive an equitable share of the wealth he creates. True, it has taken two wars, added to long years of economic instability to establish this recognition of the dependence of the modern world on its farmers as the producers of food and clothing, and also to awaken the primary producer to this sense of his importance in the community.

The time is now opportune for primary producers to take full advantage of the latest developments in the mechanisation of their industries and in co-operation for the marketing of their products. They must,

however, at the same time, practise methods of crop husbandry that will conserve the fertility of their soil and not exploit them; and raise their livestock by sound and economic methods, safeguarding themselves against stock losses in times of drought by putting aside reserves of fodder in good seasons.

It is certain that for several years to come the overseas demand for foodstuffs will exceed the supply available and that good prices will rule for our exportable surpluses. This gives the Australian farmer a breathing spell which he must utilise to the full in raising not only the volume, but also particularly the quality, of our production.

It is certain also that within a few years we will be faced with keen competition from other countries, which have the advantage of being closer to the markets of the world, and we must do everything possible to ensure that we can meet this competition on an even basis.

The Department of Agriculture, of which I am proud to be the Ministerial head, will assist producers in every way possible to solve their problems, increase their yields and generally improve their conditions. The officers of the Department join with me in extending sincere good wishes to the primary producers of the State for the years ahead.

E H Graham

Food and Agriculture Organisation.

New South Wales Committee to be Established.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) has received advice that the Premier has approved establishment of a Food and Agriculture Organisation Committee in New South Wales.

This Committee, the Minister stated, was to function under the Chairmanship of Dr. R. J. Noble, Under Secretary and Director of the Department of Agriculture, who led the Australian Delegation to the F.A.O. Quebec Conference in 1945. The other members would be:

Mr. T. C. Roughley, Superintendent of Fisheries.

Dr. H. G. Wallace, Deputy Director-General of Public Health, and Member of the State Nutrition Committee.

A representative of the Department of Conservation, which controls the Forestry Commission, the Soil Conservation Service and the Water Conservation and Irrigation Commission.

It was hoped to arrange the inaugural meeting of the Committee at an early date.

F.A.O. was the first of the various United Nations Organisations to be established. Discussing the significance of F.A.O., both to Australia and the post-war world at large, Dr. Noble stated that F.A.O. aimed primarily to promote "freedom from want"—as expressed in the pledges of the Atlantic Charter. Towards achievement of this aim, the functions of F.A.O. were, briefly: to promote efficiency in production, distribution and utilisation of the products of the farms, forests and fisheries of the world; to improve levels of nutrition and to improve standards of well-being of both producers and consumers.

Marketing was regarded as the crux of the whole food and agriculture problem. Inefficient production and distribution represented waste which an impoverished world could ill afford.

Continued effective research and education through F.A.O. would do much to promote efficiency and to eliminate this waste. Increased industrialisation and increased production of protective foodstuffs, particularly in under-developed countries, would help remove many of the evils associated with poverty and would help to promote purchasing power.

Fruit Fly Control Measures are Compulsory.

ALL owners or occupiers of land upon which one or more fruit trees are growing are bound by law to exercise certain control measures. These include the application of tartar-emetic or sodium-fluosilicate poison bait to the trees at least every week and the immediate collection and destruction of fallen or infected fruit. Destruction must be by thorough burning or boiling. Burial of waste or infected fruit is a punishable offence.

Particulars of the poison bait and of other requirements may be obtained from the local fruit inspector or from the Department of Agriculture, Box 36A, G.P.O., Sydney.

VARIETIES OF WHEAT RECOMMENDED

For 1948 Sowing.

THE outstanding feature of the 1947-48 wheat season has been the widespread epidemic of stem rust which caused serious losses to many farmers, especially those in northern and central wheatgrowing areas. Damage from stem rust will doubtlessly amount to millions of bushels. Fortunately an appreciable acreage had already been sown to stem rust resistant wheats in the North-west. These wheats, Gabo, Charter, Yalta, Kendee and Celebration all retained their high degree of stem rust resistance under epidemic conditions. They yielded heavy crops of plump grain under conditions where adjacent crops of rust susceptible wheats such as Eureka, Gular, Pusa, Bordan and even Ford were heavily attacked and produced light-weight grain and in some cases almost complete crop failures.

As the result of this stem rust epidemic the Standing Advisory Committee on Wheat has decided to recommend the much more widespread cultivation of these rust resistant varieties.

As the result of war-time conditions followed by drought years over much of the State in 1944 and 1946, the amount of available yield information on the rust resistant varieties when grown in central and southern parts of the wheat belt is more limited than the Committee would have desired. Unfortunately, also, seed supplies of the rust resistant wheats are limited and the shortage of bags will, to a considerable extent, restrict any large movement of seed of the rust resistant varieties from northern to central and southern wheat areas.

In spite of these facts the inclusion of many of the resistant wheats in recommendations for Zones 5 to 23 is considered to be justified. In most instances a standard rust susceptible variety has also been retained in the recommendations because it is believed that farmers will in many instances be unwilling, perhaps rightly, to swing over completely to the growing of new varieties with which they are not familiar. Even where this is not so, it is realised that seed of the resistant varieties will be so limited that it will be necessary to plant a considerable part of many farms with the older susceptible varieties.

The complete breakdown in resistance to rust of Eureka was again confirmed. During 1947 Eureka was one of the most heavily rusted varieties and in spite of its many other good qualities it has been removed from the list of recommendations. The record of this variety draws attention to the possibility of any of the stem rust resistant varieties becoming susceptible with a change in the rust parasite.

Unless otherwise mentioned the varieties of wheat recommended are suitable for both grain and hay. The accompanying map shows the wheat zones.

Time of Sowing.

Varieties are classed as suitable for "Early Sowing," "Mid-season Sowing" and "Late Sowing" in relation to the normal range of sowing dates for the district. Wheats suitable for early sowing are usually late maturing, and if sown late they may be prematurely hayed off by excessive heat and may also be more liable to destruction by rust. On the other hand, early maturing varieties suitable for "Late Sowing" may, if sown early, come into head prematurely and be destroyed by frost or cold damage. Early maturing varieties should, therefore, *not* be sown early, nor should late maturing varieties be sown late. Within reasonable limits early sowings are likely to be more satisfactory in most districts than late plantings.

Early Sowing.—Ford type of wheat.

Mid-season Sowing.—Bencubbin type of wheat.

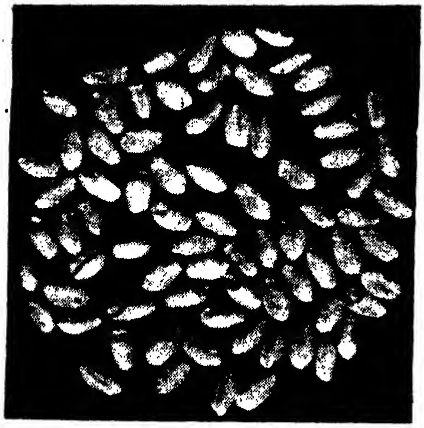
Late Sowing.—Gular type of wheat.

It is considered very important that growers should pay close attention to the maturity and time of sowing of the new rust-resistant wheats. During 1947 the sowing too early of such early maturing varieties as Gabo and Charter resulted in considerable damage from stem frost injury. The following is the correct time of sowing of these varieties:—

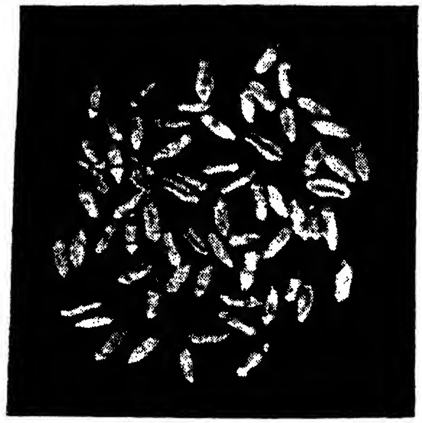
Early Sowing.—Celebration.

Mid-season Sowing.—Yalta, Kendee.

Late Sowing.—Charter, Gabo.



Charter.



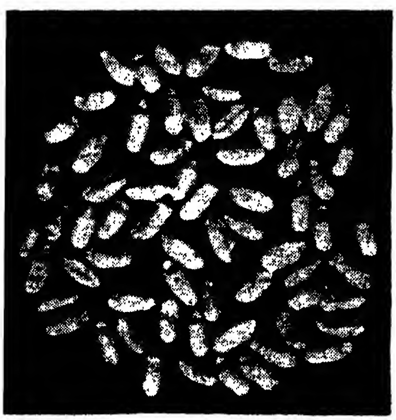
Eureka.

Yalta.

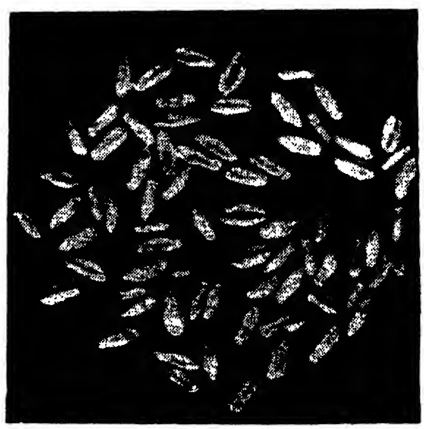
Effect of Stem Rust on Wheat Grain.

The accompanying illustrations show typical grain samples of non-susceptible and susceptible varieties, taken during a heavy stem rust emidemic.

The samples were taken from crops grown side by side in the north-west.



Celebration.



Ford.

NORTHERN WHEAT BELT.

Zone 1: Northern Tableland.

(Armidale, Glen Innes.)

Mid-season Sowing—Ford, Celebration.

Late Sowing—Yalta.

Zone 2: North-western Slopes—Eastern Portion.

(Warialda, Delungra, Inverell, Bingara, Barraba, Attunga, Tamworth, Quirindi and Upper Hunter Districts.)

Early Sowing—Fedweb 1, Celebration, Bordan (for Upper Hunter).

Mid-season Sowing—Yalta, Kendee.

Late Sowing—Charter, Pusa 4, Gabo.

Zone 3: North-western Slopes—Western Portion.

(Manilla, Somerton, Curlewis, Gunnedah, Boggabri, Mullaley, Tambar Springs.)

Early Sowing—Fedweb 1, Ford, Celebration.

Mid-season Sowing—Yalta, Kendee.

Late Sowing—Charter, Pusa 4 and Gabo.

Zone 4: North-western Plains.

(Boggabilla, Garah, Gravesend, Pallamallawa, Bellata, Narrabri, Baan Baa, Wee Waa, Pilliga, Baradine, Coonamble.)

Early Sowing—Ford, Fedweb 1, Celebration.

Mid-season Sowing—Yalta, Kendee, Charter.

Late Sowing—Charter, Pusa 4, Gabo, Bungulla (Baradine and Coonamble districts only).

CENTRAL WHEAT BELT.

Zone 5: Central Tableland.

(Bathurst to Orange Districts.)

Mid-season Sowing—Bordan, Ford, Celebration.

Late Sowing—Waratah, Charter.

Zone 6: Central-western Slopes—North-eastern Portion.

(Coonabarabran, Binnaway, Mendooran, Leadville, Coolah, Dunedoo, Gulgong, Mudgee, Wellington, Geurie.)

Early Sowing—Ford, Bordan, Celebration.

Mid-season Sowing—Bencubbin, Baroota Wondre (for hay only), Yalta, Kendee.

Late Sowing—Gabo, Charter.

Zone 7: Central-western Slopes—Central-eastern Portion.

(Molong, Manildra, Cumnock, Cudal, Cargo.)

Early Sowing—Bordan, Ford, Celebration.

Mid-season Sowing—Bencubbin, Yalta, Kendee.

Zone 8: Central-western Slopes—South-eastern Portion.

(Cowra, Canowindra, Eugowra, Goolagong, Koorawatha, Greenethorpe, Grenfell.)

Early Sowing—Bordan, Ford, Celebration.

Mid-season Sowing—Yalta, Kendee, Waratah, Bencubbin.

Zone 9: Central-western Slopes—North-western Portion.

(Tooraweenah, Gulargambone, Gilgandra, Eumungerie, Dubbo, Wongarbon, Tomingley.)

Early Sowing—Ford, Celebration.

Mid-season Sowing—Bencubbin, Yalta, Kendee.

Late Sowing—Gabo, Charter.

Zone 10: Central-western Slopes—South-western Portion.

(Parkes, Forbes, Bogan Gate, Peak Hill, Trundle.)

Early Sowing—Ford, Celebration.

Mid-season Sowing—Bencubbin, Kendee, Yalta, Baroota Wonder (for hay only).

Late Sowing—Gabo, Koala, Baroota Wonder (hay only).

Zone 11: Central-western Plains—Northern Portion.

(Albert, Tottenham, Trangie, Narromine, Condobolin, Euabalong.)

Early Sowing—Bencubbin, Yalta, Kendee, Baroota Wonder (for hay only).

Mid-season Sowing—Gular, Koala, Gabo, Bungulla.

Zone 12: Central-western Plains—Southern Portion.

(Cargelligo, Tullibigeal, Hillston, Merriwagga, Weethalle, Rankin's Springs, Yenda, Griffith.)

Early Sowing—Bencubbin, Yalta, Kendee.

Mid-season Sowing—Gular, Bungulla, Gabo.

SOUTHERN WHEAT BELT.

Zone 13: Southern Tableland.

(Goulburn, Yass, Federal Territory.)

Mid-season Sowing—Ford, Celebration.

Zone 14: South-western Slopes—Eastern Portion.

(Young, Boorowa, Bendick Murrel, Murrumburrah, Wallendbeen, Cootamundra, Stockinbingal.)

Early Sowing—Bordan, Ford, Celebration.

Mid-season Sowing—Bencubbin, Yalta, Kendee.

Late Sowing—Gabo.

Zone 15: South-western Slopes—Central Portion.

(Bribbaree, Quandialla, Caragabal, Temora, Ariah Park, Barmedman.)

Early Sowing—Bordan, Ford, Celebration.

Mid-season Sowing—Bencubbin, Kendee, Yalta.

Late Sowing—Gabo.

Zone 16: South-western Slopes—Western Portion.

(Wyalong, Ungarie, Barellan, Ardlethan, Tallimba.)

Early Sowing—Ford

Mid-season Sowing—Bencubbin, Kendee, Yalta.


MAP
OF
NEW SOUTH WALES
SOUTH PACIFIC OCEAN
TASMAN SEA
QUEENSLAND
STATE OF SOUTH AUSTRALIA
STATE OF VICTORIA

Late Sowing—Gabo, Bungulla (northern section only).

Zone 17: North-eastern Riverina.

(Junee, Marrar, Coolamon, Wagga, Uranquinty, The Rock, Milbrulong, Lockhart.)

Early Sowing—Bordan, Ford, Baroota Wonder (for hay only).

Mid-season Sowing—Kendee, Yalta, Baroota Wonder (for hay only), Bencubbin.

Late Sowing—Gabo.

Zone 18: South-eastern Riverina.

(Yerong Creek, Henty, Pleasant Hills, Culcairn, Holbrook, Walbundry, Walla Walla, Gerogery, Jindera, Albury, Tumbarumba, Brocklesby, Balldale, Corowa.)

Early Sowing—Bordan, Ford, Celebration.

Mid-season Sowing—Bencubbin, Kendee, Yalta.

Late Sowing—Waratah, Gabo.

Zone 19: North-central Riverina.

(Ganmain, Grong Grong, Narrandera, Darlington Point, Boree Creek, Urana.)

Early Sowing—Ford.

Mid-season Sowing—Bencubbin, Kendee, Yalta.

Late Sowing—Gular, Gabo.

Zone 20: South-central Riverina.

(Rand, Daysdale, Oaklands, Jerilderie, Berrigan, Finley, Tocumwal, Mulwala.)

Early Sowing—Ghurka (for grain only), Ford.

Mid-season Sowing—Ranee, Bencubbin, Kendee, Yalta.

Late Sowing—Gular, Gabo.

Zone 21: Western Riverina.

(Deniliquin, Mathoura, Moama.)

Early Sowing—Ghurka (for grain only).

Mid-season Sowing—Ranee, Kendee, Bencubbin, Gabo.

Zone 22: Far-western Riverina.

(Moulamein, Balranald, Euston.)

Early Sowing—Ranee (for grain only), Bencubbin.

Mid-season Sowing—Gabo.

Zone 23: Murrumbidgee Irrigation Area (on irrigated areas).

Early Sowing—Bordan, Ford, Celebration.

Mid-season Sowing—Kendee, Yalta.

Late Sowing—Gabo.

COASTAL DISTRICTS.

Early Sowing Only—Ford, Celebration.

Early Maturing Varieties for Hay or Green Fodder—Charter, Gabo, Florence.

Notes on Recommended and Grown Wheat Varieties.

The following descriptions of recommended varieties and those likely to be grown are given as a guide to farmers in the choice of the best varieties of wheat for their conditions.

Baroota Wonder—Essentially a hay wheat of excellent quality and acre yield for mid-season and later sowings. Farmers are strongly urged to sow the headlands of paddocks (which are usually cut for hay) with this variety. The growth is moderately tall, with slender, heavy weighing stems which cure to a desirable green colour. The leaves are moderately sparse, and generally free of disease troubles. The variety is slightly resistant to flag smut, but is susceptible to stem rust.

Bencubbin—A popular wheat of mid-season sowing, highly resistant to flag smut, but susceptible to stem rust. On account of its tall growth and tendency to lodge, it should not be grown on over-rich soils or in districts of high rainfall. The grain bleaches fairly readily, and although classed as a weak flour wheat, it matures a bright grain of moderately good flour when grown within the lower rainfall districts. The area sown to this variety has become excessively great, and its part replacement with medium-strong varieties would ease some problems connected with flour blends and export shipments.

Bordan—A variety lately recommended for early sowings within favoured rainfall districts. It is tall growing, susceptible to stem rust, but moderately resistant to flag smut, and the grain is of the medium-strong flour class. In many respects Bordan resembles Ford, and is likely to replace it in districts of good rainfall, as it often has a higher yielding capacity. It does not, however, finish quite as well should the late spring conditions be dry. As a hay wheat, it is not quite the equal of Ford in quality.

Bungulla—A very early maturing selection from Bencubbin which it resembles in general characters such as resistance to flag smut, straw weakness and flour quality.

Celebration (Double cross x Dundee x Dundee*).—Recommended for early sowing, *i.e.*, April. It is highly resistant to flag smut; it is a main crop variety, highly resistant to the prevalent races of stem rust. The straw is tall and of satisfactory strength, and in these respects is similar to Ford. The ear is moderately long, tapering, smooth, and light-brown in colour. The crop threshes easily, but the grain appears to be held rather loosely in the ripe ear, and further observations are required under varying seasonal conditions to determine whether the variety is predisposed to shattering.

The stooling capacity is good; the ear has a tendency to develop two grains wide, but under favourable conditions the development of three

*The double cross parent is a sister line to the American variety Thatcher (Marquis x Kanred x Marquis x Iumillo).

grains wide may be expected. The yielding capacity is high within the main crop group of late maturing varieties. The grain is moderately long, moderately plump and is frequently vitreous. The flour quality comes within the medium-strong class, and is somewhat superior to Ford in gluten quality.

Charter.—In maturity this variety falls between mid-season and early maturing wheats. It is highly resistant to stem rust and to flag smut and may be classed as a strong or "premium" wheat, the grain of which is frequently vitreous. Its straw is tall and somewhat Ford-like, so that Charter can scarcely be recommended for planting on heavy soils in preference to a strong-strawed wheat. It may prove to be a desirable early hay wheat.

Dundee.—A productive variety for mid-season sowing. Moderately short straw; moderately resistant to flag smut but very susceptible to stem rust and susceptible to frost damage. It is classed as a medium-strong flour wheat, and under suitable dry ripening conditions produces a vitreous grain, but it frequently produces a mottled grain. In view of the extreme susceptibility of Dundee to stem rust, it is considered that its cultivation should be reduced in areas where other wheats of approximately equal yielding ability are available.

Eureka.—A mid-season sowing wheat of medium height and strong straw. Susceptible to stem rust and moderately susceptible to flag smut. It is a high-yielding variety and produces a medium-strong flour of high quality. Eureka 2 is similar, a week later in maturity and stronger strawed.

Fedweb 1.—A short, strong straw variety suited to early sowings, particularly within the north-western portion of New South Wales. It is highly resistant to stem rust, but susceptible to leaf rust, flag smut and Septoria. The grain, which is held firmly, is in the medium-strong flour class and is of high quality.

Florence.—A wheat suited to late sowings, with tall slender straw. Moderately resistant to flag smut and to stem rust. Highly resistant to bunt. The grain is very subject to shedding; it is generally hard and vitreous, with medium strong flour. Recommended only for green fodder and hay in coastal districts.

Ford.—A tall growing variety, possessing straw which picks up and combs well, or makes into good hay of good colour and quality; it is susceptible to stem rust and flag smut, and the grain is of the medium-strong flour class. Ford "finishes" better than most varieties, even though the late spring may be dry, and the grain also appears to have a satisfactory resistance to bleaching. It is recommended for extensive sowings in all but the lower rainfall districts.

Gabo (Bobin selection x Gaza x Bobin selection).—Recommended for late planting, and not prior to early June, within the north-western districts—Zones 2, 3 and 4. It is highly resistant to the known races of stem rust, but has recently become susceptible to leaf rust; moderately susceptible to flag smut. The straw is short and of satisfactory strength; the ear is white, compact, of moderate length, and although the crop threshes readily, the grain is held in the ripe ear satisfactorily and is not predisposed to shattering.

The stooling capacity is good, being above the average of the quick-maturing varieties; the ear has the characteristic of developing three grains wide; the yielding capacity is high.

The grain is of moderate size, deeply creased, and is lacking in a smooth plump finish. The flour quality is of the medium-strong class.

Seed of Gabo is in keen demand and its area increase within the next few years may be spectacular, and particularly so within the earlier sections of the north-west. Farmers are reminded that its earliness puts it out of the class of a main crop variety, except perhaps within the early sections, and that elsewhere it should not be sown prior to the end of May. Any earlier plantings will tend to promote over-rank growth which may be liable to stem and ear frost damage. The moderate flag smut susceptibility is not likely to be a serious weakness in such a late-sown variety.

Ghurka.—A variety suited to early sowing within the Western Riverina; possessing very short, strong straw. Resistant to flag smut and has some resistance to stem rust. Grain of we.. flour strength.

Gular.—Is susceptible to flag smut and to stem rust. It is in the medium-strong flour class. The grain is generally hard and vitreous, being but little inferior to Pusa 4 in baking quality; it is, therefore, a high premium wheat.

Kendee (Dundee x Kenya).—Highly resistant to the prevalent races of stem rust, but is leaf rust susceptible to the same degree as most of the commercial varieties; resistant to flag smut. The straw is of moderate height and strength; the ear is white, compact, of moderate length, and although the crop threshes readily, the grain is held in the ripe ear satisfactorily and is not predisposed to shattering.

The stooling capacity is good; the ear has the characteristic of developing three grains wide; the grain is of moderate size and moderately deeply creased, and is lacking in a smooth plump finish. The flour quality is of the medium-strong class.

Kendee is a little later in maturity—approximately two weeks—than Gabo. It will more nearly approach a main crop variety for the early locations and is suitable for moderately late plantin within the three north-western zones. Its freedom from flag smut and its slightly better grain finish than that of Gabo are advantages.

Koala.—An early maturing, moderately short and strong-strawed wheat which is very attractive to the farmer in field characteristics. It is, however, only moderately resistant to flag smut and very susceptible to stem rust. It has an attractive grain which in bushel weight is superior to that of most other varieties. Its grain quality is slightly better than that of Bencubbin.

Pusa 4.—A late sowing variety with slender straw; somewhat resistant to flag smut; susceptible to stem rust. Grain generally hard, and in the strong flour class. On account of its relatively light yield it is suitable only for a few localities in northern districts.

Pusa 111.—A smooth-chaffed selection from Pusa 4, to which it is similar in all other characters.

Ranee.—A mid-season sowing wheat, with short, fine but strong straw; susceptible to flag smut and to stem rust. A weak flour wheat.

Waratah.—A mid-season wheat. The straw is slender and tall but picks up and combs well should the crop become lodged. This variety is susceptible to flag smut. The grain is of the weak flour class. Ripe crops are liable to shed. Most of the area previously sown to Waratah is now sown to Bencubbin.

Yalta (Kenya x Pusa 4 x Dundee).—This is a main crop variety; highly resistant though not immune to the prevalent races of stem rust; it is leaf-rust susceptible to the same degree as most of the commercial varieties; it is highly resistant though not immune to flag smut. The straw is of moderate height and of satisfactory strength. The ear is creamy, of moderate length, compact and squarish; the chaff is pubescent (short hairs), and although the crop threshes readily, the grain is held in the ripe ear satisfactorily and is not predisposed to shattering. Stooling capacity is good.

The grain is moderately small, of shallow crease, plump, vitreous, of amber colour; the bushel weight is high. The flour quality is of the strong class and approaches the Pusa varieties with respect to gluten quality.

This variety has disease resistance, desirable field characters, and premium quality grain.

Soybeans.

Greater Yields Obtained by Harrowing Growing Crops.

EXPERIMENTS at New England Experiment Farm, Glen Innes, last season, demonstrated very clearly the benefit of harrowing the growing soybean crop.

This harrowing must take place before inter-row cultivation, otherwise the young plants are easily harrowed out. Harrowing across the rows has been found to be the most effective means of checking weed growth (particularly in the rows themselves) provided it is done when the plants are from 4 to 6 inches high and on a warm, sunny day.

It was noted in the growing crop at Glen Innes that the plants in the harrowed sections of the experiment were taller and more vigorous, and that weed growth was only light. In the non-harrowed areas the soybeans were stunted and yellowish, and weed growth was profuse.

In a replicated trial with "Potchefstroom 169" variety, sown in rows 28 inches apart, the harrowed section gave a yield of 30.5 bushels per acre, and the non-harrowed section 22.5 bushels. Irrespective of the distance between the rows, this yield increase was maintained.—W. D. KERLE, Special Agronomist.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Berry (Jubilee)	January 30, 31
Guyra	February 13, 14
Yass	February 13, 14
Bundarra	February, 14
Boorowa	February 17, 18
Inverell	February 20, 21
Newcastle (P. G. Legoe)	February 25, 26, 27, 28
Comboyne (W. R. Cooke)	February 26, 27
Dorrigo (W. Tomlinson)	February 26, 27
Bega (Jas. Appleby)	February 26, 27, 28
Armidale	February 26, 27, 28
Tenterfield	February 26, 27, 28
Moss Vale (T. H. N. Binney)	February 26, 27, 28
Queanbeyan (Darcy Vest)	February 27, 28
Walcha	March 2, 3
Glen Innes (M. R. Aggs)	March 2, 3, 4
Uralla	March 5, 6
Manilla	March 5, 6
Warialda	March 5, 6
Taralga	March 9, 10
Tumbarumba (Mrs. Roy O'Shea)	March 9, 10
Tamworth	March 9, 10, 11
Cumnock (C. Reynolds)	March 10
Bingara	March 10, 11
Blayney (K. Gressor)	March 12, 13
Quirindi	March 13, 14
Sydney Royal	March 20 to 31
Gloucester (Mrs. M. A. Newton)	April 9, 10
Macksville (D. Turner)	April 9, 10
Barraba	April 9, 10
Bellingen (C. P. Francy)	April 12, 13
Orange	April 13, 14, 15
Grafton (C. W. Creighton)	April 15, 16, 17
Gunnedah	April 15, 16, 17
Hawkesbury District (Clarendon) (T. J. Cambridge)	April 15, 16, 17
Boggabri	April 20, 21
Narrabri	April 23, 24
Urbenville (S. Stoddart)	April 23, 24
Dungog	April 30, May 1
Trangie	May 4, 5
Gilgandra (A. Christie)	May 18, 19
Sydney Sheep Show	June 2, 3, 4, 5
Wagga	August 24, 25, 26
Narrandera	September 10, 11

TEMPORARY PASTURES IN THE WHEAT ROTATION.

J. N. WHITTET, H.D.A., Principal Agronomist (Pastures).

THE demand for increased quantities of animal products of all descriptions means that greater calls will be made on pasture and crop areas, and consequently, in addition to conducting good pasture management practices, an endeavour must be made to establish additional areas of sown pastures and grazing lucerne.

While the Department's pasture establishment investigations indicate that the most effective way of sowing pasture and lucerne is on well-worked fallows, using 1 cwt. of superphosphate per acre, many wheat-farmers sow their pasture plant seed at the same time as the last wheat crop in a rotation.

The seeding rate for wheat under these conditions should not exceed 45 lb. per acre (on soils which produce a rank growth use only 30 lb. per acre) in order to give the pasture plants a chance to become established and not be unduly crowded by the rapid growing cereal.

Should the spring be dry, the young pasture plants are likely to suffer, because the more robust rooting systems of the cereal plants will unfavourably compete with those of the pasture plants for soil moisture.

Where pasture seeding with a cereal is to be carried out, wheat is preferred to oats, as the latter crop crowds the pasture seedlings more than wheat plants.

The recommendations of pasture mixtures for the various wheat zones—as shown in the map on page 6—are as follows:—

Pasture Recommendations.

Wheat Zone No. 1.

Sow a mixture of Italian Rye 10 lb. and Red clover 4 lb. seed per acre; on heavy basaltic flats, add 2 lb. Black Medic (*Medicago lupulina*) seed to the mixture.

Wheat Zone No. 5.

In the higher rainfall sections of this district, sow Perennial Rye 5 lb., Wimmera Rye 1 lb., Subterranean clover (mid-season) 3 lb. and lucerne 2 lb. per acre on soils of good depth; where soils are shallow omit the lucerne from the mixture. In the lower rainfall section of the area (such as Bathurst) sow Wimmera Rye 1 lb., Subterranean clover (mid-season) 2 lb., Ball clover 1 lb. per acre; on soils of good depth add lucerne 2 lb. per acre to this mixture.

Wheat Zone No. 7.

Sow Wimmera Rye 1 lb. lucerne 3 lb., Subterranean clover (early strain) 1½lb. per acre in localities where soil types are heavy and rainfall is lower than in other sections of the area. On the lighter soils, substitute Subterranean clover (mid-season) 1½ lb. for the early strain in localities which experience a higher rainfall.

Wheat Zone No. 8.

Sow Wimmera Rye 1 lb., lucerne 3 lb., Subterranean clover (early strain) 1½ lb. per acre on soils of good depth; on soils too shallow for lucerne sow Wimmera Rye 2 lb. and Subterranean clover (early strain) 3 lb. per acre.

Wheat Zone No. 10.

On the heavier textured soils, sow Wimmera Rye 1 lb. per acre with the last wheat crop; Burr Trefoil develops naturally on these soils. Where the soils are deep, and particularly where occasional flooding occurs, sow Wimmera Rye 1 lb. and lucerne 2 lb. per acre; in the eastern portion (Parkes) add Subterranean clover (early strain) 2 lb. to this mixture.

Wheat Zone No. 11.

In this area the heavy textured soils produce an abundant growth of Burr trefoil, and it is only necessary to include Wimmera Rye 1 lb. per acre. On the lighter textured soils sow Wimmera Rye 1 lb. and lucerne 2 lb. per acre.

Wheat Zone No. 13.

In the higher rainfall sections of this area Italian Rye 10 lb. and Red clover 4 lb. is a satisfactory mixture for a short term pasture of two years. Where a hardier mixture is required, plant Wimmera Rye 2 lb., Subterranean clover (mid-season strain) 3 lb., Ball clover 2 lb. per acre; on deep, well-drained soils add 1 lb. of lucerne seed to this mixture.

Wheat Zone No. 14.

Plant Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb. where soils are of good depth; on shallower country, use Wimmera Rye 3 lb. and Subterranean clover (mid-season strain) 3 lb. per acre.

Wheat Zone No. 15.

On the lighter soils east of Temora and in the Barmedman district, plant Wimmera Rye 1 lb. lucerne 1 lb., Ball clover 1 lb. per acre. On heavy soils sow Wimmera Rye 2 lb., Barrel clover 1 lb. per acre. Generally the heavy soils carry sufficient Burr trefoil seed to make the sowing of this species unnecessary. If Burr trefoil is insufficient, add 1 lb. per acre to the above mixture.

Wheat Zones Nos. 2, 3, 4, 6, 9, *and* 12.

Where soils are friable and deep use a mixture of Wimmera Rye 1 lb., lucerne 2 lb. and Burr trefoil 2 lb. per acre; on the heavier types of country, unsuitable for lucerne, sow Wimmera Rye 3 lb. and Burr trefoil 4 lb. per acre. In Zone 9 substitute for Burr trefoil 4 lb., a mixture of Burr trefoil 2 lb., Ball clover 1 lb. and Barrel clover 1 lb. The lower rainfall sections of Zone No. 12 are too dry for lucerne and there the Wimmera Rye-Burr trefoil mixture should be planted.

Wheat Zones Nos. 17 *and* 18.

In the good rainfall sections sow Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb., Ball clover 1 lb., and Barrel clover 1 lb. per acre on soils of good depth; omit lucerne on the shallow soils. Use Subterranean clover (early strain) 2 lb., instead of Subterranean clover (mid-season strain), in the lower rainfall parts of both these zones.

Wheat Zone No. 19 *and the Eastern half of Zone No.* 20.

Use Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (early strain) 2 lb., Ball clover 1 lb. and Barrel clover 1 lb. per acre on deep soils. In the case of shallow soils omit the lucerne and increase the Ball and Barrel clover seedings to 2 lb. each.

Wheat Zone No. 16 *and Western half of No.* 20.

Plant Wimmera Rye 2 lb., Ball clover 1 lb., Barrel clover 1 lb. per acre. In the better rainfall sections on deep soils lucerne 1 lb. can be added to the mixture. The lower rainfall sections of Zone 20 are too dry for lucerne.

Wheat Zones Nos. 21 *and* 22.

In these Zones sow Wimmera Rye 3 lb., and Burr trefoil 3 lb. per acre.

Irrigated Areas.

The most satisfactory method of establishing pastures on irrigated country is to sow the grass and clover seeds mixture on a correctly graded and well prepared seed bed, and not with a crop of wheat.

Suitable temporary pasture mixtures for irrigated country would be:—

(a) Where the amount of water is limited in quantity:—Wimmera Rye 2 lb., lucerne 2 lb., and Subterranean clover (mid-season strain) 2 lb. per acre.

(b) In areas where the water supplies are plentiful:—Italian Rye 2 lb., Wimmera Rye 2 lb., Perennial Rye 4 lb., Red clover 2 lb., Subterranean clover (mid-season strain) 2 lb., lucerne 2 lb. per acre. On shallow soils having impervious subsoils close to the surface, omit lucerne from the mixture.

General Notes.

Owing to the large amount of "hard" seed in Ball and Burr clovers, only scarified seed of these species should be planted.

One of the disadvantages of sowing lucerne with wheat, is that if the spring and early summer months turn in very dry, this legume is unlikely to become established satisfactorily when sown with a cover crop.

In heavier rainfall districts and under irrigation, other grasses and clovers such as *Phalaris tuberosa*, Perennial Rye, White clover, are suitable for the establishment of permanent pastures; these species, however, are too valuable to include in the wheat rotation as they would be approaching their maximum carrying capacity when wheat was to be planted again.

Any farmer requiring details of suitable permanent pasture mixtures for his country should write to this Department for recommendations, or contact the District Agronomist.

Further details covering pasture improvement operations will be found in the following publications which can be obtained, free of cost, from the Department of Agriculture, Sydney:—

Pasture Improvement in Northern Tableland Districts.

Pasture Improvement in Central and Southern Tableland Districts.

Pasture Improvement in the Slopes, Plains and Western Division.

Lucerne as Pasture in Western Districts.

Methods of Establishing Improved Pastures.

Methods and Machinery for Top-dressing Pastures.

Pasture Management.

Pasture Improvement on the Murrumbidgee Irrigation Area.

Irrigation Farming—With Special Reference to Wakool and Berriquin Irrigation Districts.

New Manager at Temora Experiment Farm.

MR. T. E. KITAMURA has been appointed Manager of Temora Experiment Farm, to replace Mr. C. K. Vears, who is to be appointed Assistant Principal Research Agronomist. In making this announcement, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that since March, 1946, Mr. Kitamura had acted periodically as Manager at Temora.

Temora Experiment Farm was the centre where all basic work was undertaken for departmental pure seed wheat production, said Mr. Graham. Mr. Kitamura had been engaged in cereal-breeding work, mainly directed towards improvement of varieties for flag smut resistance and improved baking quality, with special regard to the mallee districts of New South Wales, at Temora since 1937. His long association with the problems of cereal breeding made him an excellent choice for the position of Manager at Temora.

CABBAGE CULTURE.

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

CABBAGES are exceptionally hardy and may be grown successfully in all parts of the State from the far western districts (such as Menindie), the semi-tropical Far North Coast areas to the coldest portions of the Southern Monaro.

Apart from its extensive use as a cooked vegetable, cabbage is often eaten raw in salads, in which state it is a valuable source of Vitamins B and C. The green leaves of cabbage are also rich in Vitamin A, though the white inner leaves of the heart contain only a small amount of Vitamin A.

Climatic Requirements.

Cabbage does best in cool districts that are favoured with a regular rainfall. Localities which have 35 to 40 inches of rain well distributed are suitable. In such areas cabbages may be grown without irrigation, but for uniformly good results irrigation is necessary in all districts.

Spring and summer cabbages are mostly grown in Moss Vale, Bundanoon and similar districts. On the Far North Coast cabbages are essentially a winter crop.

Around the market garden areas of Newcastle and Sydney, and along the banks of the Hawkesbury and Hunter Rivers, large areas are devoted to cabbage production all the year round, best quality hearts and highest yields being obtained from crops grown through the cooler months. During the summer months cabbages must be heavily irrigated in these localities and regularly dusted to control insect pests.

Cabbages are capable of withstanding extremely cold conditions where seedlings are raised in the autumn and the plants thus gradually are subjected to lowering temperatures. In many countries it is customary for cabbages to be planted during the autumn and for them to winter under snow conditions and mature the following spring.

Soil Requirements.

Cabbages may be grown successfully on a wide variety of soils ranging from light sands to heavy clays. Soils well supplied with organic matter which retain their moisture and have good drainage are very suitable. The alluvial soils, rich in organic matter and of a high water-holding capacity that are found along the coastal and western rivers of New South Wales, are of this type.

A Well-grown Crop of Cabbages.

Sandy soils are suitable for early production, while heavy clays and loams produce large crops of late cabbages. Cabbages do not require the same rich soil conditions as cauliflowers.

A Typical Early Jersey Wakefield Cabbage.

Poor soils may be rendered suitable for growing profitable crops of cabbage by the use of animal manures at the rate of 10 to 20 tons per acre or by growing green manure crops.

Soil Preparation.

As they are related to brussels sprouts, cauliflowers, etc., it is important that none of these crops follow in rotation with cabbages.

Where animal manure is scarce a green manure crop should be grown before planting out cabbages. For the summer green manure crop, black cowpeas are recommended, and for winter, oats or black winter rye with field peas or vetches are suggested. Excellent results will be obtained if the green manure crop is turned under two or three weeks before transplanting the cabbage seedlings.

The first ploughing of the soil should be as deep as possible without turning up the subsoil.

After the land has been allowed to lie for several days it should be broken down by cultivation and reploughed or disced crossways at a shallower depth. During this working any available animal manure should be incorporated into the soil. Thereafter a weed-free fallow should be maintained until the area is planted.

Fertiliser Recommendations.

In coastal districts and in basaltic soils of the tablelands 1 to 1½ tons of magnesium limestone (dolomite) per acre should be worked into the soil during its preparation.

On very rich soils, good crops may be grown with 4 cwt. superphosphate and 1 cwt. of sulphate of ammonia per acre, applied along a furrow immediately under the transplanted seedlings. For most soils, however, 10 to 15 cwt. per acre of a mixed fertiliser, containing approximately 4 per cent. nitrogen, 12 per cent. phosphoric acid and 4 per cent. potash, should be broadcast and worked into the ground before transplanting, or applied along the furrow under the seedlings. For poorer soils the use of 1 ton of mixed fertiliser per acre may be profitable.

In addition to these base dressings of fertiliser, cabbages should be side dressed with nitrate of soda or sulphate of ammonia at 1½ cwt. per acre when the heads are forming.

A Good Specimen of Copenhagen Market Variety.

Time of Sowing.

On the coast cabbage seed is sown from November to February or March and again in August. In the warmer districts seed may be sown in May for the production of spring cabbage. In tableland districts such as

Robertson, seed may be sown in April and May, and the plants held in seed-beds over the winter until August, when they are transplanted. Seed is also sown from August to December in these districts.

An Enkhuizen Glory Cabbage.

In inland districts the seed is usually sown from late December to about February. Plants started later than February in districts other than warm coastal areas are liable to develop seed stalks prematurely.

Seedling Raising.

Where the soil preparation is carried out in a very thorough manner, cabbage seed may be sown direct in its permanent position in the field. Most growers, however, prefer to raise the seedlings in seed-beds for transplanting to the field. Raising the plants in seed-beds allows more time for preparation of the soil, gives the quickest means for controlling diseases and pests in the small seedlings, and enables seedlings to be planted out which are very uniform in size.

Seed-beds for cabbages are located in the open. The chief consideration should be to have a very fine, rich, and well-prepared seed-bed close to a water supply. The soil of the seed-bed should be treated with magnesium limestone (dolomite) and a little superphosphate. It should be raked and brought to a fine state of tilth before seeding.

Cabbage seed should be sown in rows spaced not closer than 4 inches apart and preferably 8 to 12 inches apart to provide ample space for tillage and weeding. The seed is sown to a depth of ½ to ¾ inch. In hot dry weather seed-beds should be thoroughly watered and mulched after sowing.

When sown in rows, 1 lb. of seed will produce about 38,000 to 40,000 plants, but broadcast the germination often is inferior, the wastage of plants greater and usually 1½ lb. of seed is required to produce the same number of plants. Four to 8 ounces of seed should provide sufficient plants for 1 acre.

While plants are in the seed-bed steps should be taken to free all seedlings of the grub of cabbage moth and of aphis, by dusting with D.D.T. and nicotine dusts. The plants are ready to transplant when they are about 4 inches in height.

Method of Transplanting.

Large areas often are planted by means of transplanting machinery which automatically set the plants in the soil and water them in.

Growers with spray irrigation usually either plant in shallow furrows or mark out rows with a planting line and set the seedlings in the usual way. Plants are watered as soon as possible after they are planted, or the ground is watered before transplanting.

Typical Specimen of the Succession Variety.

With furrow irrigation the usual method of transplanting is to strike out drills 2 feet

6 inches or 3 feet apart, fill the furrows with water and then transplant the seedlings into the mud.

Before removing cabbage plants from the seed-bed they should be given a thorough dusting with D.D.T. and nicotine dust in order to clean up insect pests. Another method is to pull the plants, make them into small bundles and then vigorously rinse the top growth in a strong solution of Blackleaf 40 in soapy water.

The spacing of cabbages varies considerably with the variety, climatic conditions, method of growing and marketing methods. For country markets a large cabbage often is grown and plants are set out in 3 feet rows with the plants 2 feet apart. When irrigation is not practised, large late varieties such as Succession are planted 3 feet apart each way.

Where irrigation is available and a medium-sized cabbage is desired, the rows usually are spaced 2 feet 6 inches apart with the plants 18 inches to 2 feet apart in the rows.

Under intensive market gardening methods cabbages are planted 15 to 18 inches apart in rows which are 2 feet to 2 feet 3 inches apart and the crop is forced at all stages.

Cultivation and Side-dressing.

Cabbages thrive on regular and heavy waterings, but are very susceptible to injury by bad drainage. The crop should be cultivated and hoed between the plants to eradicate weeds and to keep the soil in good condition. As the plants become older cultivation should be shallow so as not to injure the roots. Cultivation during the heat of the day while the large leaves are somewhat wilted will reduce mechanical damage to the crop.

When the plants are about half grown and the leaves begin to close over they should receive a side dressing of sulphate of ammonia or nitrate of soda at 1½ cwt. per acre. Poultry manure, if available, may be used as a substitute. Side dressing can be repeated if desired.

Cabbage Plants Selected for Seed Production

The head on the right has the outside leaves stripped prior to transplanting.

Harvesting and Grading.

The market demand in cabbage is for hard, medium-sized heads. There is some demand for the large Succession type of cabbage by shippers, hotel keepers and Government institutions.

Cabbages should be cut as soon as the hearts are hard, as from this stage on they become more fibrous, less palatable, and lose market value, and there is also a distinct danger of the hearts bursting.

Cutting should be carried out in the cool of the morning, if possible. The heads should be trimmed of yellow and otherwise discoloured and damaged leaves, and graded for size and quality.

A good grade of cabbages should be of one type, fresh, of good solidity, and not soft, withered, puffy or burst. They should be free of disease, seed stalks, yellow or otherwise discoloured leaves and damage caused by frost, insects, mechanical and other means. Excess wrapper leaves should be removed, and the stem should be cut so as to be flush with the base.

The usual method of marketing cabbages in Sydney is to bring a load to the market ungraded, and to grade the cabbages according to size and quality on the selling benches. In other countries cabbages are graded on the farm, placed in suitable crates and marketed at so much a crate. In Sydney the heads are sold per dozen.

Varieties.

In selecting varieties a grower should take into consideration the time of the year he intends to plant, methods by which the crop will be grown, and the type of cabbage he desires to grow.

Following are brief descriptions of some of the more common varieties of cabbages grown in New South Wales:—

Early Jersey Wakefield. — The earliest variety grown commercially in this State, and usually harvested a little over two months after transplanting. Characterised by the small, long, pointed heart, which is of the highest quality. The outer leaves are widespread, inclined to be upturned, and comparatively flat surfaced. Should be planted very close together in the field, and responds to forced feeding right throughout.

Copenhagen Market. — Usually takes two and a half months to mature after transplanting. Small, very hard hearted, plant does not grow much more than a foot in height. Noted for its very outstanding heart and rather flattened scanty outer leaves. Has given exceptionally good results on the poorer clayey soils of the Metropolitan Area, and can be recommended in all districts where the soil is of doubtful fertility.

Enkhuizen Glory. — A popular variety among the best cabbage growers of the State. It is an early maturing, round head type. Responds to good soil conditions and heavy feeding. One of the outstanding features of Enkhuizen Glory is the exceptionally solid head. The variety holds in the field after maturity better than most early varieties, but is very liable to burst after rain. The outer leaves are scanty, allowing little wastage in the field. Enkhuizen Glory is recommended for all districts.

Early Forcing Globe. — Excellent under forcing conditions of growth, and of attractive market size. Early maturing, producing a round, very compact, solid head. Is not a good carrier, but for local marketing conditions this is not a disadvantage.

Drumhead. — One of the most popular varieties grown. Is a reliable cropper under almost all conditions and can be depended upon to give heavy yields in all districts. Exceptionally large plant with a very solid heart. The outer leaves lend a good deal of protection to the heart, which makes it an excellent carrier. Does best as an autumn and winter crop.

Succession. — The most popular of all varieties grown in New South Wales. Largest of all cabbages grown here; has a very large amount of outer leaves. Strains vary a good deal one from the other, not only in variety characteristics, but also in the length of time for maturity. Responds to good soil conditions, but will produce payable crops in most districts.

Burrawang. — There are several types of Burrawang, varying from an early, pointed type, sometimes called Sugarloaf, to a later, very compact solid-headed type. These strains are very dependable croppers and give exceptionally good results under forcing conditions during the spring and summer months. The round, solid-headed strain is the more popular with commercial growers.

Savoy Cabbage. — This is a group of cabbage varieties characterised by deep-green colour and wavy, wrinkled leaves. The chief characteristic is its exceptionally high quality, particularly when produced in cold districts. Appears to be very suitable for tableland districts.

Red Cabbage. — There is a small but steady demand for red cabbage, mainly for pickling and culinary purposes.

Cabbage Seed Production.

Although much has been done with the production of vegetable seed in this State, and the results obtained with cauliflowers

have been perhaps as outstanding as any, it is to be regretted that the growing of cabbage seed has been almost neglected.

It should be noted that plants of the *Brassicae* family, including Brussels sprouts, cabbages, cauliflowers, etc., readily cross-pollinate.

Technique in growing cabbage seed is not particularly exacting. Good yields of seed can be obtained without undue trouble, and there are many districts in this State which are favourable for cabbage seed production.

The crop should be ready to cut in the late winter months, so that the selected plants will develop seed heads during the spring and early summer months. Heads for producing seed should be selected at the cutting stage. It is most important that only carefully selected plants should be saved for seed. Plants selected should possess all the variety characteristics and should be free of disease.

They should also be selected for uniformity in time of maturing. To achieve uniformity in maturity, selection work should be carried out during one day, so that all the plants will be maturing almost together. The next point is to select the cabbages so that they are all of the one size and of one type. Outstanding types seldom breed true, and only complicate selection work. It is much better to select only uniform, medium-sized plants.

The selected plants may have the outside leaves stripped off them, and they may be dug up, retaining as many feeding roots as possible, and transplanted to an isolated position. Once the plants are well rooted the heart should be slashed across the top to allow the seed head to push through. After the plant is in full flower the bottom heart leaves can be stripped off. The plants should be sprayed or dusted for the control of cabbage grubs, aphids and thrips.

The seed plant is a very erect grower, the blooms are yellow and the seed forms in pods.

If the pods are allowed to remain on the plant until they are fully mature they will split open and much of the seed will be lost through shattering. The whole of the plant should be cut when the majority of seed has reached the mature stage prior to the shattering stage. The plants are then hung in an airy shed over a tarpaulin and allowed to dry thoroughly. During this process a good deal of seed will be shattered, but can be recovered from the tarpaulin. Care must be taken that the seed pods are not heaped in the shed, as mildew will develop and destroy the seed.

After the seed in the pods is dry it should be thrashed, cleaned and then stored in suitable bags in an airy place.

A second method of growing cabbage seed is to mark special plants, and after cutting the heart out for market, allow the stumps to grow new side shoots, which later, in the spring, put up seed heads. In this method the old stumps can be removed from the field and transplanted to a good seed-bed for seed production.

It is important that seed plants be supported by stakes to prevent wind damage.

Diseases and Pests.

Diseases of the cabbage family are preventable by the simple means of disinfection of the seed by the hot-water method before sowing, rotation of crops and choice of land which will not render crops liable to malnutritional diseases.

The principal diseases of cabbage are black rot, sclerotinia rot, downy mildew, rhizoctonia rots, black-leg, and ring spot, while deficiencies of magnesium, potash and lime commonly cause trouble.

Cabbages are attacked by several insect pests, of which cabbage moth, white butterfly, cutworm, vegetable weevil, slatey-grey aphid, green aphid and Rutherglen bug are the most important.

Leaflets on the control of these diseases and pests are available from the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

IN an effort to preserve native flora the Government has prohibited the picking of protected flowers and plants, including most flowers and plants commonly met with in bush lands—except on private property and with the permission of the owner. Police are keeping a strict watch, and many honorary rangers have been appointed to see that the provisions of the law are observed.

THE

BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics.

MANY farmers throughout the State have for long recognised the importance of accurate and unbiassed information on prices, production trends, market prospects and possibilities and the many other matters which enter into the business side of farming. Unfortunately information of this nature is not always readily available in this country. Up to now the *Agricultural Gazette* has been concerned largely with the various technical aspects of farming and most of the articles and notes appearing in its pages have dealt with technical problems.

This month we introduce a new regular feature—"The Business of Farming"—being notes prepared by the Division of Marketing and Agricultural Economics. It is hoped that it will help fill the growing demand for reliable and unbiassed information relating to current production trends, market prices and prospects, to the economics of new production techniques, to the costs of various farm operations and practices and to the many other matters which are more or less the daily concern of every farmer whose aim is to run his farm efficiently and well.

To state that farming to-day is a business first and foremost is, perhaps, merely to repeat a truism, but nevertheless the fact remains that the farmer who desires to live comfortably and to attain some reasonable degree of financial security can no longer afford to conduct his affairs in a haphazard and unbusinesslike manner. To-day and in the future the prosperity of our rural industries will depend in the final analysis not merely on efficiency in production, but on efficiency in all aspects of business management. Without reliable, accurate and up-to-date information, real business efficiency is unattainable, and it is hoped that these notes will help in some small way those farmers who realise that efficiency in production and business management provides the only means of achieving genuine and lasting prosperity for our rural industries.

The farming community and others interested in agriculture are invited to offer suggestions and criticisms which would make this section of the *Gazette* more effective and useful.

The Future of Farm Prices.

There have been so many warnings in the last two years from bankers, economists and businessmen that prices of our agricultural exports will fall, whilst in fact they have continuously increased, that it is not surprising that the farming community may be inclined to ignore those who have often cried "wolf" in the past. This tendency will be reinforced by the natural assumption, which is usually made in prosperous times, that high prices and prosperity will continue or even increase.

Whilst it is not possible to say definitely when farm prices will fall or whether they will rise even further before they fall, no

opportunity should be lost to reiterate that, at some stage in the not too far distant future, a fall in farm prices must be expected. It is certainly the safest assumption a farmer can make, for if he plans his production and expenditure accordingly, his losses will not be large if a recession does not come, or if it comes and is not severe. But if it does come in full force, he will be able to weather it.

What steps can the individual farmer take to prepare himself for a fall in farm prices? Although the farmer cannot shut up shop there are certain things he can do to prevent his income from falling as much as it otherwise would. These are broadly to reduce his cash expenses and increase efficiency. In dairying, for instance, culling of herds should be done vigorously and promptly. These animals bring more now than later. Those which are kept should be well fed and well cared for so as to produce as much milk or butter-fat as previously with a larger herd. Feed should not be purchased in such large quantities that substantial amounts are carried over into future years as feed prices may have fallen by then.

Indebtedness should be reduced as much as possible in this period of high prices so as to reduce the interest burden which will have to be met out of smaller annual cheques in the future. Farmers who contemplate retiring should sell out while land values are high, whilst sharefarmers and others who want to start farming on their own account would be well advised to postpone purchase of a farm for the time being and become or remain a share or tenant farmer.

Care should also be exercised in the purchase of farm machinery. At the moment machinery, when available, is cheap in terms of farm prices, but this may not continue for long. Therefore the purchase of machinery which will not pay for itself for many years should be postponed where practicable.

The Future of the Egg Industry.

The egg industry is one that has shown very considerable expansion in all States of the Commonwealth during recent years. Recorded commercial production in New South Wales and Australia for the past four seasons is set out in the following table:—

Recorded Commercial Production of Eggs.

	1943/44	1944/45	1945/46	1946/47
	m. doz.	m. doz.	m. doz.	m. doz.
New South Wales	42	47	50	54
Australia	80	104	113	123

The above figures include production from all flocks of over forty laying hens. Flocks of more than this number, from which eggs have been produced for sale either to Egg Boards or privately, have been under Commonwealth control since November, 1943. Actual figures for recorded commercial production in pre-war years cannot be used in relation to the above figures in order to illustrate the true trend in production since that period. For instance, in New South Wales prior to November, 1941, the Egg Board controlled eggs produced only in the Counties of Cumberland and Northumberland and the Shires of Nattai and Wollondilly. Since that date, however, the whole of the State has been controlled and the country areas to-day produce almost 40 per cent. of the total controlled commercial production. Nevertheless, it can be estimated that total production of eggs in New South Wales by last season, had increased by about 65 per cent. since 1939. Taking Australia as a whole the increase was probably in the vicinity of 80 per cent.

This increase in production has naturally been accompanied by greater marketing problems. Although as a result of the war there was a considerable increase in the consumption of eggs within Australia, the export surplus to-day is at least four times larger than pre-war. The problem of disposing of the export surplus was simplified during the war by reason of the large demands from Allied Services in the Pacific. In addition, much of the wartime demand was for processed eggs, which could be transported and stored more easily than eggs in shell.

The difficulties confronting egg marketing authorities to-day are much greater than

they ever have been before. The main export market is now in the United Kingdom. Australia has an assured market there for all the eggs she can export for the next few seasons, although by reason of the higher price for eggs in the shell in the export contract, Britain has indicated very clearly her preference for them. While there can be no talk of over-production in the Australian egg industry for several years, provided a sufficient proportion of the eggs produced comes up to export quality, unfortunately at the present time this quality is not being obtained. This is the reason why we see slogans urging the Australian people to eat more eggs, when Britain is crying out for increased supplies.

There is a very definite danger of a glut of eggs on the Australian market, simply because insufficient of the eggs produced meet export standard requirements. A lowering of the export standard is not the solution, if only for the reason that in the future interest of the egg industry, Australia cannot afford to sacrifice her reputation on the United Kingdom market. The problem can only be solved by the combined efforts of producers and marketing authorities in Australia. The recent drastic action in regard to washed eggs was taken in an attempt to increase the export pack. "The battle for export quality eggs" is on. Its success or otherwise will determine the future welfare of the egg industry.

Agricultural Lime.

The practice of applying lime to farm soils periodically is an old one. The farmers of Europe have long recognised the fact that soils become "sour" after a period of cropping or prolonged grazing and require lime to make them "sweet" again. In New South Wales most soils in districts with an annual rainfall of 25 inches or more require liming. Broadly speaking, this means most of that part of the State which lies east of a line drawn from Albury to about Mudgee and thence along the Dividing Range to the Queensland border.

The quantity of lime needed to correct acidity depends partly on the type of soil and partly on the degree of acidity. Your local agricultural instructor will be able to give you advice as to the quantity of lime per acre needed in your locality.

According to experimental work which has been done here and abroad, the use of lime on lime-deficient soils increases legume yields markedly and aids fertilisers in producing a more abundant and nutritious growth. On some of the leached soils of the coastal belt, lime has given a further 100 per cent. production over all other treatments when measured in terms of grazing hours.

Before applying lime to the soil a careful consideration of the relative cost of different forms of lime may save the careful farmer a lot of money.

Lime is applied to the soil either as quick lime, slaked lime or ground limestone. Any of these forms of lime can be used, though quick lime is unpleasant to handle and gives off large quantities of heat when allowed to get wet, and is therefore not commonly used. Which form of lime is the most economical to use will depend on the relative prices of the three forms. The effectiveness or "neutralising value" of the three types is in the approximate ratio of 56 : 75 : 100. That is 56 lb. of quick lime will have substantially the same effect as 75 lb. slaked lime, and 100 lb. ground limestone (taking limestone as 95 per cent. pure).

To work out which particular form of lime is the cheapest in a particular situation, let us take the following hypothetical prices at the lime quarry: Ground lime, 35s. a ton; quick lime, 75s. a ton; slaked lime, 50s. a ton.

A farmer 100 miles by rail from the nearest lime works would pay £2 a ton for ground lime, £4 a ton for quick lime and £2 15s. a ton for slaked lime. However, these prices do not tell us which is relatively the cheapest form of lime. In order to obtain that we must work out prices for quick lime and slaked lime on a comparative basis with a ton of ground limestone. This can be done easily by multiplying the price of quick lime by $\frac{56}{100}$ and that of slaked lime by $\frac{75}{100}$.

(*Continued on page 46.*)

GL156-24

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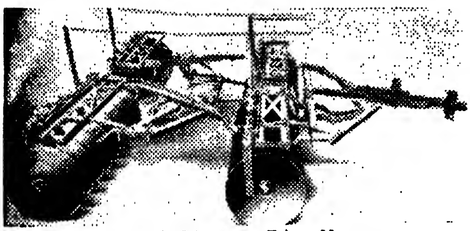

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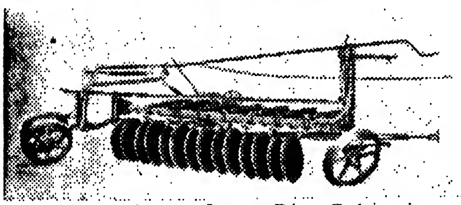

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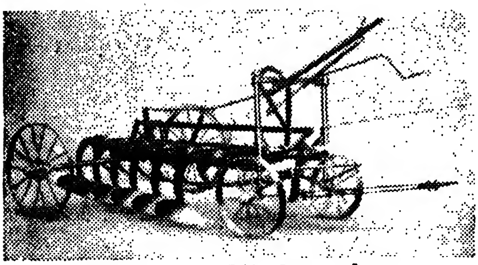

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HAYMAKING

A Means of Conserving Fodder

That is Palatable and Nutritious.

(Concluded from Vol. 58, page 644.)

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

THIS is the concluding instalment of this article, sections of which have appeared since July, 1947, issue. In the instalments to date the place of hay in the fodder conservation programme has been discussed and details given of the growing, curing, stacking and baling of cereal, lucerne and pasture hays.

The current instalment deals with the care and maintenance of mowers and binders, and with the food values of hays.

The Care and Maintenance of Mowers.

The cutting action of a mower is similar to a pair of shears, the knife section acting as one blade and the ledger plate as the other, the two cutting surfaces being kept in contact by a clip. The knife section cuts at an angle, which causes the knife to be forced back against the wearing plate, which latter keeps the blade in a straight line. If at any time a guard or finger is bent out of line the knife may be too far away from that particular ledger plate if bent downwards, or lifted off one or more ledger plate if bent upwards. In either case the effect is ragged cutting and unnecessary wear, and a periodic check up for bent guards is advisable. As the wearing plate becomes worn through use, it should be adjusted so as to keep the knife in line.

Ledger plates which have become dull should be sharpened or replaced, and if at any time only one blade has to be replaced and it is higher than the others, a strip of tin in the form of a shim can be placed between the guard and the under side of the cutter bar to maintain the correct alignment. When the mower has been in use for some time the clips wear, allowing the knife to rise up from the ledger plates, causing inefficient cutting. The clips can be bent down with a sharp blow of a hammer, but be sure to test for free travel after each clip has been closed.

The Pitman drive may wear out of alignment with the cutter bar, causing excessive

wear of all moving parts. Some mowers provide adjustment for aligning the cutter bar and others are set about 1 inch ahead to counteract the pressure when cutting; when wear becomes excessive a new yoke pin will sometimes correct the trouble. The joints at the end of the Pitman rod should be kept tight to prevent damage.

The pawl and ratchet drive should be inspected occasionally for broken springs, washed in kerosene and re-assembled.

Gears should be maintained in proper mesh; that is, the teeth engaging as deeply as possible without seizing.

The rollers for the canvases should be kept square, to prevent the canvas creeping to one side; this adjustment is provided by altering the tension on the cross brace members. The upper elevator should be at the same height as the lower at front and back, the adjustment being provided at the goose neck attachment. When installing canvases

A Well-built Haystack. Built on straddles as a protection against mice. This stack is also protected against rain damage by a thatch, and against damage by birds (particularly galahs and cockatoos) by wire netting.

Reapers and Binders.

A common mistake in the use of these machines is travelling too fast over rough ground, which literally shakes them to pieces. They work best on level, even ground, which permits of cutting lower; and all obstructions such as pieces of wire, etc., should be removed, if noticed, during cultivation and sowing.

The platform should be level and high enough to prevent it dragging on clods of earth and small obstructions, and the front of the crop wheel should have a lead in to the binder. These two precautions reduce side draught, which is also less when the knives are kept in good condition.

Chains should have just sufficient slack to prevent them binding on their sprockets, and should be installed with hooks or lips out and leading as they pass over the drive sprockets. Where there is little dust about chains should be lubricated, but under dusty conditions it is better not to lubricate at all, on chains, as the oil picks up dust and grit, which cause rapid wear.

they must be tightened evenly on both sides, or they will creep to one side, and the flight strips may be broken through passing over the roller at an angle. The flap of the canvas should point in the opposite direction to the direction of travel.

The twine tension does not affect the tightness of the sheaf but is designed to take up the slack in the twine as it is pulled forward by the needle in tying the sheaf. To much tension only wears out the eye of the needle and causes the twine to break.

To increase the size of the sheaf the compression arm should be adjusted outwards on its stand. Lowering the trip lever has the same effect; the adjustment on some binders is effected by a slot and serrated face, allowing the lever to be raised or lowered as necessary.

The tightness of the binding of the sheaf is increased by tightening up the spring on the stop arm—by a few turns of the wing nut under the deck of the binding attachment. This increases the pressure required to depress the trip lever, so that more hay is compressed into the space available.

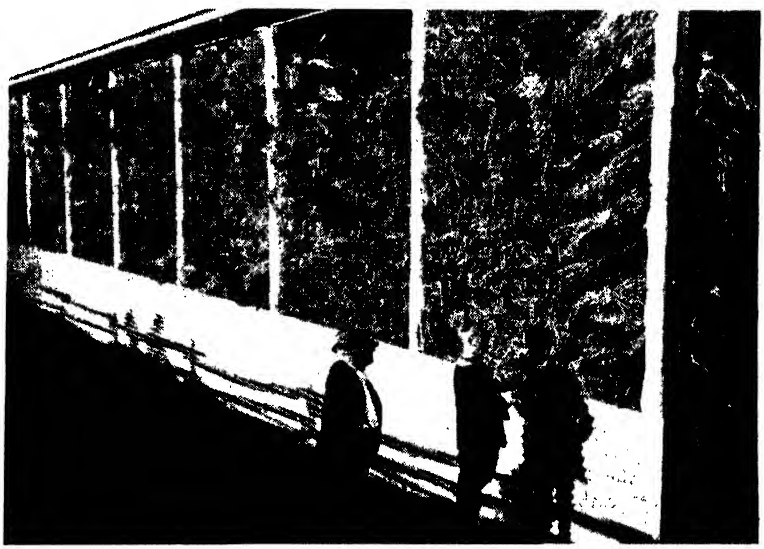
Amount of Twine Used.

One ball of twine is usually sufficient for 2¼ to 3 tons of hay, depending largely on the type and height of the crop.

The Food and Money Value of Hays.

Samples of hay can be compared in terms of units of food value once their chemical compositions are known. However, the food values of hay will vary according to the type of cereal, the variety, the locality and the soil type. It is, therefore, not possible to generalise and give a definite figure for, say, oaten hay which will fit all samples.

The ability of a feed to provide energy or fat-producing material is measured by "food units" or "starch units" per 100 lb. The derivation of this term is simple; stating that oaten hay has a food unit or starch unit value of 40 per 100 lb. means that 100 lb. of oaten hay are equivalent to 40 lb. of starch in energy or fat-producing ability; 100 lb. of wheaten straw, a low food value feed, is equivalent to only 14 lb. of starch, and so has a food unit or starch unit value of 14.



A Solidly-constructed Hay Shed of 150 Ton Capacity.

Mouse proofed by galvanised iron set in concrete.

The ability of a food to produce protein is measured by crude protein percentage (such as shown on tags of bags of feed; *e.g.*, linseed meal contains 30 per cent. crude protein): or, more accurately, by protein units per 100 lb. This latter figure takes into account digestibility and other factors. Linseed meal has a value of 25 protein units per 100 lb.

Relative Costs of Food Units and Protein.

Protein units are the dearer of the two to purchase or grow, although the home-grown article is always the cheaper. It is necessary to provide a sufficient quantity of protein in a ration to balance it, but no more than necessary should be provided for economical feeding.

Food units in the form of wheat grain can be purchased for about 1d. a unit, while purchased as hay the cost varies from about 2d. to 3d. The livestock owner should, therefore, endeavour to grow his own roughages, if necessary, purchasing cereal grains and other concentrated feeds to provide further energy-supplying material. The food units in home-grown roughages may not cost more than a penny per unit or less, but roughages have an additional value in adding to the bulk of a ration.

The principle remains the same when roughages are short or have to be purchased; a minimum quantity should be provided—sufficient only to add the required bulk to the ration. The remainder of the food units needed should be purchased or provided in the form of the cheaper cereal grains.

Other factors which add to the value of a hay are the quality of the protein content.

For example, legume hays are superior to cereal hays because of the higher value of their protein content when utilised for milk or meat production, and to some extent because of their higher vitamin content and mineral content—particularly vitamin A, and the minerals calcium and phosphorus which are necessary for bone production in growing stock, and milk production in dairy cattle.

Although the money values per ton of oaten and wheaten hays are similar, lucerne hay has a justifiably higher money value because of the higher biological value of its protein, which makes it a valuable supplement to other hays or silages.

Food Unit Values.

Some representative figures for the food values of various roughages and a few starchy concentrates are shown in the accompanying table.

FOOD VALUES OF ROUGHAGES.

Feed.	Food Units per 100 lb.	Protein Units per 100 lb.	Remarks.
Lucerne hay or chaff ...	35–45 av. 40	9	Valuable protein, mineral and vitamin content.
Oaten hay...	33–40	3–3·5	Used to provide food units and bulk in the ration.
Wheaten hay	31–33	3·0	
Oaten straw	20	0·6	Too expensive to buy as roughages at usual prices.
Wheaten straw	14	0·1	
Oat hulls	21	0·5	Usually a comraratively cheap source of roughage.
Rice hulls...	3	0·3	Useless as a fodder.
Wimmera rye grass hay...	41	5·8	Compares very favourably in analysis with cereal hay.
Subterranean clover hay	38	7·9	Similar value to lucerne hay.
Wimmera rye grass–Subterranean clover hay ...	36–40	4·0–5·0	
Starchy Concentrates.			
Maize and maize meal ...	78	8	
Wheat barley and their meals	70	8	
Oats	62	8	
Pollard	66	10	

Wastage in Overhead Silos.

Use of Sawdust as a Preventive.

A DISTRICT Dairy Officer of the Department recently observed an instance in which sawdust had been used successfully as a sealer on top of material in an overhead silo, the losses being much less than with earth as a covering.

Immediately after the silo had been filled, a layer of approximately 6 inches of sawdust had been placed on top. When the silo was opened after several months, it was found that below the sawdust there was a semi-solid cake of silage, approximately 4 inches thick, below which the silage was perfectly normal.

Sawdust is readily obtainable in most districts—sawmillers being only too pleased to get rid of it. In view of the experience of the farmer concerned, it is considered that use of sawdust is worth trial by other farmers.

Sawdust has the distinct advantage over soil of being much lighter and therefore much easier to transport into the silo, also to take out when the silage is to be used. It should seal more closely than soil and be particularly valuable when it has not been possible to fill the silo completely, owing to shortage of materials.

Another advantage claimed for the sawdust method is that it can be conveyed to the top of the silo by the conveyor or blower used for raising the silage. Sawdust is apparently unattractive to rodents, as no infestations of the silos by rats or mice have been noted since introduction of sawdust for sealing.

Specimens for Examination.

Instructions for Forwarding to Department of Agriculture.

ALL members of the public who from time to time forward specimens of plants, fruit, vegetables, insects, etc., to the Department of Agriculture, are asked to observe the following necessary precautions:

(1) The package should be securely wrapped and tied with strong string, with due regard to the contents.

(2) The nature of the contents of each package should be clearly indicated on the outside of the package. Name and address of the sender must also be shown.

(3) A separate letter in relation to the specimens forwarded should always be addressed to the Department.

Observance of these precautions will be a direct help to the Department in furnishing the information sought. Many packets and parcels are received daily by the Department, and much time can be saved if these articles when received can be immediately directed to the Divisional authorities concerned without the necessity of opening the packages.

Packages should be addressed clearly to the Under-Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney. They should always be despatched so as to arrive in Sydney before the week-end, in order that specimens may be in as fresh as possible a condition when examined.

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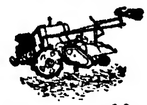

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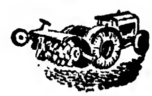

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OAT AND BARLEY VARIETIES.

Recommendations for 1948 Sowing.

ONE of the essentials to success in the growing of the winter cereals, oats and barley, is to sow varieties suited to the climatic and soil conditions.

Following are the recommendations of the Department of Agriculture for the 1948 sowing season for different districts and purposes together with descriptions of the recommended oat varieties.

OATS.

North Coast.

For early green fodder—Sunrise, Buddah.

For grazing—Fulghum, Algerian.

South Coast.

For early green fodder—Belar, Sunrise, Mulga, Buddah.

For grazing—Algerian, Fulghum.

For late green fodder—Algerian.

Northern Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.

For grain or hay (autumn sowing)—Lampton.

For grazing only (autumn sowing)—Fulghum.

For grain or hay (spring sowing)—White Tartarian, Lampton.

Central Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.

For grain or hay (autumn sowing)—Lampton, Weston.

For grazing only (autumn sowing)—Fulghum.

For grain or hay (spring sowing)—White Tartarian, Lampton.

Southern Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.

For grain or hay (autumn sowing)—Lampton.

For grazing only (autumn sowing)—Fulghum.

For grain or hay in coldest parts (spring sowing)—White Tartarian, Lampton.

North-western Slopes and Upper Hunter.

For grain, hay or silage—Algerian, Belar, Burke, Mulga, Buddah.

For grazing—Algerian, Burke, Fulghum.

Central-western Slopes.

For grain, hay or silage—Algerian, Belar, Burke, Weston.

For grain, hay or silage in drier parts—Gidgee

For grazing—Algerian, Burke, Fulghum.

South-western Slopes and Eastern Riverina.

For grain, hay or silage—Algerian, Belar, Burke.

For grazing—Algerian, Burke, Fulghum.

Western Plains and Western Riverina.

For grain, hay or silage—Belar, Burke, Gidgee, Mulga.

For grazing—Burke, Fulghum.

Murrumbidgee Irrigation Area.

For grain, hay or silage—Algerian, Belar, Burke.

For grazing—Algerian, Burke, Fulghum.

BARLEY.

Recommended Varieties.

The varieties of barley recommended by the Department are:—

Malting or two-row type—Pryor.

Feed or six-row type—Trabut (for green fodder or grain).

Notes on Recommended Oat Varieties.

Algerian.—A late maturing oat suitable for grain, hay or grazing in all parts of the State with the exception of the drier western areas. Although it does not produce such a bulk of early green feed as some earlier maturing varieties, especially if sown late, it recovers very well after grazing and can be grazed well into the spring. The straw is of medium height, fine, and produces excellent quality hay. The grain is pale to medium brown, long, plump and is suitable for milling.

Algerian is susceptible to smut and to stem rust but has moderate resistance to leaf rust.

Belar.—A somewhat earlier variety than Algerian, which it resembles in its adaptation to a wide area of the State for cultivation as a general purpose oat. It is slightly taller growing than Algerian and has rather stronger straw, stands better and produces excellent hay. The grain is cream to pale-brown in colour, long, plump and of good milling quality. As a grazing variety it cannot quite equal Fulghum or Algerian, but it produces greater early bulk than the latter variety and when judiciously grazed will recover well.

The variety is susceptible to stem and leaf rust, but has some resistance to smut.

Buddah.—An early maturing oat particularly suited to growing on the coast as a green fodder and hay oat because of its resistance to leaf rust.

It is not suitable for grazing because of the sparse tillering and poor recovery. The grain is plump and creamy white in colour.

Buddah is susceptible to smut and to stem rust.

Burke.—An early oat, with short, strong straw. Its outstanding characters are its resistance to stem rust and its ability to hold the grain for long periods after maturity. The grain is rather small but the husk is thin and the yield of groats higher than in any other commercial oat. The good characters of this oat warrant greater attention being given to it by farmers.

Burke is susceptible to smut and to leaf rust.

Fulghum.—An early maturing variety of pre-eminence as a grazing oat. It has superior recovery power to any other variety of similar maturity and produces a greater bulk of early feed than any other oat. The yield of hay and grain is satisfactory but the quality of hay is not as good as that of some other varieties. The straw is rather weak, especially after maturity. The grain is of good size, plump, brown in colour but is rather short for the milling trade.

Fulghum is susceptible to stem and leaf rusts and to smut.

Gidgee.—An early maturing oat particularly suitable for hay and grain purposes in the drier districts. The straw is of medium height and of moderate strength. The grain is dark-brown in colour, and usually very plump, but is rather short and small for milling purposes.

Gidgee is susceptible to stem and leaf rusts and to smut.

Lampton.—A somewhat later maturing variety than Algerian; its use is restricted to the tableland areas under which conditions it produces heavy yields of both grain and hay. It is not suitable as a grazing oat. The grain is slightly smaller than that of Algerian, but is usually plump and of good quality. It is shiny and of a pale-brown colour.

Lampton is somewhat resistant to stem rust which renders it suitable for spring sowing on the Northern Tableland.

Mulga.—An early maturing oat suitable for grain or hay production in dry areas. As a grazing oat it produces a good bulk of early feed but recovery is poor. The straw is rather weak and for this reason the variety should not be sown early in the season as rank growth and lodging will inevitably result. The grain is large, plump and of a creamy-white to pale-brown colour.

Sunrise.—This variety is intermediate in maturity between Belar and Algerian. Its chief use is as a green fodder or silage oat on the coast where its resistance to leaf rust is of considerable value. The straw is tall and rather coarse and liable to lodging under conditions of excessive growth. The grain is large, plump and cream in colour.

Weston.—Intermediate in maturity between Belar and Algerian, Weston is a comparatively new oat likely to prove of value on the Central Tableland and the higher rainfall areas of the Central and Southern Slopes as a grain and hay oat. It has fairly strong straw of medium height. The grain is light-brown in colour.

White Tartarian.—A very late maturing oat recommended only for spring sowing on the tablelands. It has tall, coarse straw and coarse foliage, and is characterised by the fact that all the grain is borne on one side of the head. The grain is white and plump, but somewhat small. The chief value of this variety lies in its moderate resistance to stem rust rendering it suitable for spring sowing in the areas mentioned, but the coarseness of its straw and leaves is an objection, and it is likely to be largely replaced by rust-resistant varieties, such as Lampton, superior in this respect.

Approved Vegetable Seed—January, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief. Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months — E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—*continued.*

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, "Sherwood Farm," Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Pumpkin—

Queensland Blue—R. C. Morandini, Box 74 Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

FRUIT GROWING.

THINNING OF CANNING PEACHES

For Better Yields of Larger Fruit.

B. OWEN FRENCH, B.Sc.Agr., H.D.A., Assistant Fruit Officer (Research).

IF there is a market for it at all, fruit which is too small for canning will usually seil at anything from £4 to £5 per ton below canning grade.

It is not surprising therefore that small fruit is a major worry to the canning peach grower. Unfortunately, however, there is a tendency to leave the worrying until the last few weeks before harvest, when it is too late to do much about it. The time to take action is when the fruit is about the size of the top of a man's thumb.

The Importance of Fruit Size.

Generally speaking it might be said that the plant foods used in the building up of the small fruit could have been used by the tree to make the canning fruit larger. The major objective of thinning is thus to use the materials which the tree would otherwise divert to the small fruit, in the building up of the fruit left on the tree.

A tree can be looked upon as being able to provide a certain quantity of plant foods for the building up of the crop. The size of the individual fruits will depend upon how many fruits share in the distribution of the total; the more fruits on the tree the smaller is the proportion to each, and up to a point the fewer the fruit the larger will be their size.

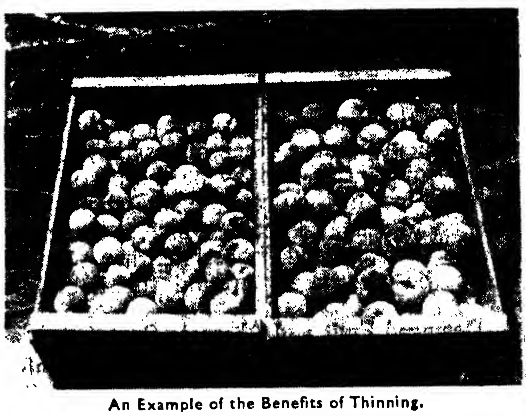
The importance of small increases in fruit size as affecting total yield is not always fully appreciated. For instance, approximately 8,000 peaches of 2⅜ inches diameter are required to provide a ton of fruit, but only 7,200 fruits of 2½ inches diameter, and 6,200 of 2⅝ inches diameter.

To look at the matter from a different point of view, if trees are planted 90 to the acre, then 800 fruits per tree of 2⅜ inches diameter would represent a total yield of 9 tons to the acre, but if the size were increased to 2½ inches diameter, the yield from 800 fruits per tree would be at the rate of 10 tons per acre, and if 2⅝ inches diameter, then to 11 tons per acre. It may be said that ⅛ inch increase in diameter of the fruit represents 1 ton per acre.

How Many Fruits are Required per Tree?

A mature canning peach tree may originally set anything up to 3,000 fruits per tree, and if all these were brought up to 2⅜ inches diameter, the tree would be yielding at the rate of 34 tons per acre approximately. Counts made on Golden Queen peach trees on the Murrumbidgee Irrigation Area have shown that 2,000 fruits per tree is quite a normal set, which at 2⅜ inches diameter would represent a per acre yield of 17 tons or at the more reasonable size of 2⅝ inches, 21 tons.

A per acre yield of 15 tons is considered to be extremely good, and it is obvious, therefore, that the trees would be grossly overloaded if left with their original set, and that to attempt to force the tree to carry



An Example of the Benefits of Thinning.
Left.—Fruit from unthinned tree.
Right.—Fruit from thinned tree—smaller in number, but larger and yielding larger tonnage per tree.
[*Photo: A. E. Vincent.*

TABLE I.

Fruit diameter.	No. of fruit in 1 ton.	Number of fruit per tree (planted 90 trees to the acre) to yield:—							
		1 ton per acre.	4 tons per acre.	6 tons per acre.	8 tons per acre.	10 tons per acre.	12 tons per acre.	15 tons per acre.	20 tons per acre.
Inches.									
$2\frac{3}{8}$ ...	8,000	88	350	530	700	880	1,060	1,320	1,760
$2\frac{1}{2}$ ...	7,200	80	320	480	640	800	960	1,200	1,600
$2\frac{5}{8}$ ...	6,240	69	280	410	550	690	830	1,040	1,380
$2\frac{3}{4}$ ...	5,760	64	260	380	510	640	770	960	1,280
3 ...	4,320	48	190	290	380	480	580	720	960

this number of fruit must result in a low percentage of canning grade fruit.

Reference to Table 1 will show that a good yield of from 10 to 12 tons per acre should be obtained from 700 to 800 fruit per tree.

Spacing is Important Too.

The production of fruit of suitable size is probably the most important reason for thinning, but there are a number of other considerations which should be kept in mind while doing the job.

Each part of the tree, limb and lateral, like the tree as a whole, must be considered as having a certain definite cropping capacity, and just as the whole tree should not be asked to carry too many fruit, so should each limb and lateral be thinned to its capacity. The aim should be to spread the load evenly over the tree according to the capacity of each part.

On young trees particularly, care should be taken not to overload the extremities of the limbs and laterals, otherwise serious breakages are bound to occur.

Fruit must have space to mature and grow. If the young fruits are left in clusters, they will push each other off as they grow and unfortunately, it may be the best fruit which is lost in this way. Fruits should be thinned to leave at least 3 inches between individual fruits and if possible, they should be spaced alternately around the lateral.

Damaged Fruit and Alternate Cropping.

Fruit situated on the ends of long laterals or in narrow twig and limb junctions will almost certainly be damaged, and consequently would be better removed in the early stages.

All small, misshapen or marked fruit should be removed first and attention then given to the better fruits, for if the fruit is small at thinning it will not catch up to the larger fruit by harvest time.

It is a common experience for a light crop year to follow an excessively heavy crop, and judicious annual thinning will help to smooth out such violent fluctuations.

To summarise, it might be said that thinning is carried out with the following objectives:—

(1) To regulate the crop to the capacity of the tree to bring all of it to canning size.

(2) To spread the crop over the tree according to the capacity of each part.

(3) To provide sufficient space for each fruit to mature.

(4) To eliminate misshapen and damaged fruit.

(5) To smooth out wide fluctuations in annual crop.

When to Thin.

Generally speaking canning peaches usually show a heavy fruit drop at from six to ten weeks after blossoming, and it would not be advisable to carry out thinning before this has occurred, otherwise thinning could quite easily be too severe.

Once the drop has occurred the sooner the job is done the greater will be the benefit, although worthwhile results can be obtained right up to within a fortnight of harvest, particularly if the tree is badly overloaded.

For best results the general recommendation is that thinning should be commenced early in the pit hardening period, which begins approximately in mid-November, and completed before the pit hardening period is finished.

Where the orchard consists of a number of varieties of different maturity dates, it is sound practice to commence thinning the early maturing varieties first. Late maturing varieties have a longer pit hardening period than the early varieties and there is

Three Peach Laterals, carrying Twenty Fruits, Before Thinning.
[*Photo : A. E. Vincent.*

thus more time available for the job with them.

How to Thin.

The capacity of a tree to mature a crop of fruit will vary according to such factors as its age, health, and the soil on which it is growing. Consequently a yield which could be reasonably expected from one block of trees would be quite out of the question for another.

Every grower will know the capacity of each block of trees on his farm and when undertaking the job of thinning he should aim to leave only that number of fruit on each tree which will be necessary to provide the desired yield. Extra tonnage should be sought by adopting improved cultural methods designed to increase the size of the fruit.

Thus if 8 tons of fruit can be reasonably expected from an acre of trees planted 90 to the acre, it will be seen by reference to Table 1 that 600 to 700 fruits per tree at the small size of 2½ inches diameter will be all that will be required. If improved cultural practices increase the size to 2⅝ inches the yield could be expected to rise to 9 or 10 tons per acre.

It is clearly impossible to count the fruit on each tree before and after thinning, but the method to be adopted involves the setting up of standard trees before operations start, and checking the reliability of the job at intervals.

Two or three trees carrying average crops should be selected before thinning commences and the number of fruit on each tree estimated. This can be done quite easily, and sufficiently accurately for all practical purposes, from the ground, by counting each limb in a systematic manner. Having decided on what is a reasonable crop and hence the number of fruit required, the quantity of fruit to be thinned off the tree can be calculated by subtraction.

The standard trees are thinned out by removing the necessary quantity of fruit and from them an idea of the "look" of a properly thinned tree is obtained. Thinning of the main block of trees can then be proceeded with, but a check should be made every now and again. This can be done quite easily by counting down one or two limbs on a thinned tree and using that as an estimate of the number of fruits left on it.

There is always a tendency to remove too few fruits, so that constant vigilance must be kept. Check counts made on trees thinned by the old spacing system have shown as many as 1,500 to 1,700 fruits left on mature trees—over twice the number required for a good crop.

Some Peach Lateral Carrying Six Fruits, After Thinning.
[*Photo : A. E. Vincent.*

It is understandable that most people would leave at least some fruit on each lateral, but this can lead to over-loading the tree. No compunction should be felt at completely stripping some laterals of all

fruit if such is necessary to bring the total load within the capacity of tree, and as a general rule no more than two fruits should be left on each lateral 9 inches long.

To remove over half the young fruit from a tree is an act of courage, but the reward will be gained through larger fruit, reduced picking costs, and a bigger harvest cheque.

Acknowledgments.

I desire to acknowledge the very valuable assistance of Mr. C. J. Horth, Lecturer in Horticulture at Hawkesbury Agricultural College, and Mr. A. E. Vincent, Fruit Inspector at Leeton, both of whom have given very valuable assistance in developing this work on the Murrumbidgee Irrigation Area.

Irrigation of Citrus Trees.

R. J. BENTON, Principal Fruit Officer (Extension).

CITRUS fruits are grown in commercial quantities in areas of this State which differ very greatly in climatic and soil conditions. In addition to a coastal strip 400 miles long and averaging about 30 miles wide (Grafton to near Camden), citrus is produced inland, the largest areas being on the Murrumbidgee Irrigation Area, and along the Murray from near Wentworth in the west to Barooga-Tocumwal in the east. Small areas are also grown in the central-west and north-west (Narromine, Dubbo and Narrabri).

Of the total production, averaging around 2½ to 3 million bushels, approximately half is produced under irrigated conditions—mostly in inland areas. There is an increasing trend to irrigate in coastal areas, but the scope is limited by lack of water.

Soils and Climate Vary.

The soils vary from light loams and sandy loams in coastal regions, to very light sandy and to heavy clay loam soils of various depth inland. The subsoils vary as widely as do surface soils. In each of the soil types in all citrus-growing localities, excellent trees may be seen.

The age of the trees varies largely in accordance with the development in the locality. In some of the oldest coastal districts there are blocks of trees up to forty years of age—although most of the areas approximate twenty years, as a result of the stimulus to planting in the years following the first world war.

Influence of Management on Tree Health.

With very variable climatic and soil conditions—many of them not favourable—in most citrus localities, weaknesses in tree health are likely to develop, particularly after the trees have produced a number of crops. The number of crops that may be harvested before poor tree health seriously affects production, depends largely on the degree of soil irregularities, and on the ability of the grower to understand and prevent the effects of unfavourable variations.

Observations and records definitely indicate that good management is a more important factor than natural conditions, good or bad, because there is much evidence that, given identical climatic conditions and apparently very similar soils, poor results follow when management is less efficient.

These results occur whether irrigation is practised or not. However, declining production of citrus trees under non-irrigated conditions is not as serious as when water is applied to the land. Lack of fertility and poor cultural practices are most often the causes behind reduced production in non-irrigated orchards.

As most of the trees irrigated are inland, tree health decline there is mainly related to the need for a better understanding of the requirements of citrus trees for soil moisture.

Serious decline, and often collapse of trees is common on the Murrumbidgee Irrigation Area. Very similar experiences occur at Barooga, Barham and farther down the Murray River, and elsewhere. Investigation into such a decline invariably shows that excessively wet soil conditions have been experienced, or are permitted to continue.

Citrus Irrigation Recommendations.

The following is a summary of the points that should be considered when irrigating

citrus in order to ensure that unfavourable soil moisture conditions are not created:—

1. Citrus trees cannot remain healthy for long if a state of excessive soil moisture exists continuously beneath the roots of trees.

2. Before irrigation is applied, many tests with a soil auger should be made to determine whether the soil is moist at a depth of a few feet. Thus the depth of penetration desirable is revealed.

3. If a wet soil condition exists continuously at a certain average depth, irrigations of a light character which cannot reach that depth must be made.

4. These light applications should not be made before it is apparent early in the morning that tree condition is approaching a wilting-of-foliage state.

5. Loss of moisture by transpiration and evaporation varies with temperatures, wind effect and tree condition.

6. Losses of soil moisture are at a minimum usually early in spring and in late autumn—hence longer periods between irrigations are necessary.

7. Because rainfall may occur, irrigations during periods of minimum losses by evaporation, should be of a lighter character.

8. If cover crop plants are grown in addition to trees, a greater demand for soil moisture will exist.

9. The regularlity of soil surface, grade and permeability of soil types will indicate whether irrigation by spraying or gravitation is necessary.

10. Where gravitational application is to be made, careful grading of soil surface and planning of a satisfactory fall is essential to facilitate an even saturation of the land.

11. A satisfactory "head of water" is also necessary to facilitate application of the water rapidly or more slowly, as the length of run, slope and permeability of the land demand.

Spread of Fruit Fly.

Samples of Infested Fruit Sought by Department.

THE fruit fly which causes great damage to the fruit of many commercial growers in coastal districts is also found frequently in many country centres, particularly from midsummer onward.

There are many centres at which fruit inspectors are not located. It frequently happens that weeks and possibly months elapse before the Department learns that losses have resulted from outbreaks of fruit fly at such centres. This makes it extremely difficult to estimate with more than approximate certainty, when and where the fruit fly is likely to appear.

A very useful purpose could be served, particularly in districts where fruit inspectors are not located, if residents and commercial growers would submit for departmental inspection, samples of fruit containing maggots.

In the case of pome fruit, maggots may not be as readily distinguished as in stone fruit. Common signs of fruit fly in pome fruit are brown-coloured irregular lines running through the fruit.

Submission of such specimens to the Department of Agriculture (Box 36A, G.P.O., Sydney), will not only enable time and locality of infection to be recorded, but may also indicate whether a species of fruit fly other than the Queensland type is responsible.—R. J. BENTON, Principal Fruit Officer (Extension).

Thrips Injure Nectarines.

Excellent Control by D.D.T. Spray.

REPORTS of plague thrips injury are usually associated with pome fruits. In seasons of heavy thrips populations, poor setting and malformed fruits are the rule—particularly with Granny Smith apples.

During the past few years many growers in the metropolitan area have also reported losses, ranging up to 100 per cent., from badly blemished nectarines. Preliminary observations suggested that the blemishes were due to colonies of young thrips feeding beneath the shucks of the young fruit.

Tests with D.D.T., 0.1 per cent. spray, carried out at West Pennant Hills this year, showed that a single D.D.T. spray applied when all the petals had fallen from the blossoms, gave a remarkable reduction of thrips numbers. This reduction was accompanied by a corresponding decrease in skin blemishes of the fruit.—S. L. ALLMAN, Senior Entomologist.

PLANT DISEASES

Notes contributed by the Biological Branch

DISEASES OF STOCKS.

BLACK rot has been the most serious disease of stocks in all parts of New South Wales since its introduction in 1938. In some seasons it is responsible for the almost complete failure of the early crop. Mosaic also is usually prevalent, and because it spoils the market value of the flowers, may be responsible for considerable loss. Root rot and sclerotinia blight are usually of minor or local importance only.

Black rot (*Xanthomonas incanae*).

This is a bacterial disease. Its most serious aspect is that a percentage of the seed produced by an infected crop will carry infection internally. The disease also spreads rapidly in the seed-bed, especially under crowded and moist conditions, so that even a low rate of seed infection may mean total loss of the crop before or after planting out.

Symptoms may develop at any time from seedling stage onwards. The lower leaves yellow and fall off, plants are stunted, and if young, wilt and collapse. Older plants, though stunted, may survive and produce flowers. Black markings develop at the points of attachment of the leaves and the lateral branches (Fig. 1). If the stem of an infected plant is cut open, black streaks can be seen in the woody water-conducting tissues. In severely affected plants the blackening extends to adjacent tissues.

The disease is most damaging in early-sown crops, those sown during the cooler months being more likely to produce a crop because of the reduced activity of the pathogen at low temperatures.

Control.—If it is obtainable, use seed from crops known to be free of disease. Seed of doubtful origin should be given the hot water treatment described below. This will eliminate most of the infection.

Fig. 1.—Black Rot of Stocks.
Arrows point to the black sunken areas where subsidiary stems joined the main stem.

Fig. 2.—Black Rot of Stocks—Late Infection.
Affected plant in centre. Note wilting and fall of lower leaves and early flowering.

Tie the seed very loosely in lots of not more than 2 oz., in squares of cheesecloth. If more than one variety is to be treated, a label can be placed in each bag to avoid mixing. Place bags of seed in a tank of water heated to 133 to 134 deg. Fahr. (56 to 56.5 deg. C.), knead bags to expel all air and keep submerged. Stir water bath to keep the temperature even throughout and maintain at the required temperature by a small burner or by the addition of extra hot water when necessary. *An accurate thermometer is essential* as a lower heat will not kill the parasite and a greater heat will injure the seed.

Fig. 3.—Stock Mosaic.
Infection causes broken colour in flowers.

After ten minutes remove the bags of seed and plunge into cool water, remove when cool, squeeze gently to remove excess water. Open the bags and spread the seed out in a single layer over the cheesecloth by hand. During the treatment the seed coats swell and become gelatinous, and the seed will therefore adhere to the cloth. Dry by spreading out the cloth on newspaper in a well ventilated but shaded place. When dry, the seed can be scraped off the cloth, separated by gentle rubbing, and stored.

The germination of good grade seed is reduced only slightly or not at all, but that of weak seed may be reduced by 20 to 30 per cent.

The treated seed should not be allowed to come into contact with anything which could reinfect it, such as crop refuse, seed dust or chaff, old seed packets, etc. The seed should be sown thinly in well-drained seed-beds, and if any sign of infection occurs, the seedlings and those around them and the soil should be carefully lifted out and burned. New soil or sterilized soil should be used for the seed beds.

Fig. 4.—Stock Mosaic—Leaf Symptoms.

Infected crop refuse should be burned and stocks should not be planted in soil which has carried a diseased crop in the previous year. A two-year rotation should be adequate.

Mosaic.

Mosaic is a virus disease affecting stocks and a number of related plants and weeds. Affected stocks are more or less stunted, the leaves being closer together than normal. The leaves are mottled with patches of lighter colour, a symptom not always easy to see because of their natural greyish colour, and are distorted and wrinkled. The flowers are streaked and spotted with lighter colour or white and are unsaleable.

The natural method of spread is by aphids, which can transfer infection to a healthy plant after having fed on a diseased one. The green cabbage aphid and the slatey-grey aphid are capable of transferring the disease. The disease is also so highly infectious that it can be transferred on the hands or on cutting implements. Once infected a plant cannot be cured.

Control.—Remove and burn infected plants as soon as seen, spray regularly with nicotine sulphate and soap, or dust with 2½ per cent. nicotine dust for aphid control. If an infected crop has been grown, burn it or plough it in and allow a clear break of three months before replanting stocks.

Eliminate any related weeds such as shepherd's purse, charlock, mustards, hoary or field cress and wild turnip. These weeds, and also turnips, honesty, alyssum and wallflower may harbour aphids which carry the virus and some may become infected and serve as a starting point for the infection of the next stock crop. Infection may sometimes start from year-old stock plants in neighbouring gardens.

The virus will not carry over in the soil, and seed from infected plants is not infected and will produce a healthy crop.

Crown rot (*Rhizoctonia solani*).

This is a disease chiefly of the seed-bed. It is caused by a parasitic soil-inhabiting fungus which attacks and rots the stems of seedlings at ground level, causing wilting and death of the plant.

Control.—Use clean soil or a soil sterilized with formalin solution (1 part formalin plus 50 parts of water). One gallon of solution is used for each square foot of ground. After application of the solution the soil

Fig. 5.—Crown Rot of Stocks.
Caused by fungus *Rhizoctonia solani.*

should be covered with bags for a few days. If the disease appears in the seed-bed, corrosive sublimate (1 oz. to 12 gallons of water), watered on to the base of the seedlings, sometimes proves useful in preventing the spread of the trouble.

Sclerotinia Blight (*Sclerotinia sclerotiorum*).

This disease is sometimes serious in cool wet weather in late autumn and winter. The fungus attacks leaves and stems, causing a soft rot. Affected tissues become covered with a white cottony growth and resting bodies up to ¼ inch long, which are at first white and later become black, are formed on the surface.

Control.—Remove and burn plants as soon as seen; otherwise the disease will spread rapidly. Do not plant stock in soil known to be badly infested.

Wide spacing and good ventilation and drainage are important.

Root rot (*Pythium* sp.).

This disease is caused by a soil-inhabiting parasitic fungus which attacks and rots the finer roots. Plants may be infected at any stage. They wilt and die quickly or remain stunted. It is serious only in heavy wet soils.

Control.—Plant stocks in well drained soil. If the disease appears, lengthen rotation. Do not grow beans in rotation with stocks if this disease is present.

Leaf Spot Diseases.

A number of leaf spot diseases have been recorded from stocks in New South Wales but none of them appears to be of economic importance.

New Plant Diseases.

DURING the year ended 31st December, 1947, the following diseases were recorded for the first time in New South Wales:—

Acacia podalyriaefolia (Queensland Wattle)—*Phytophthora* sp. (Collar rot); Metropolitan Area.

Allium cepa (Onion)—*Ditylenchus dipsaci* (Kuehn.) Filipjev. (Bloat); Largs, West Maitland.

Antirrhinum majus (Snapdragon)—*Heteropatella antirrhini* Budd. & Wakef. (Shot hole blight); Metropolitan Area, Young.

Berberis darwinii (A barberry)—*Phytophthora parasitica* Dast. (Root rot and shoot blight); Metropolitan Area.

Bothriochloa decipiens (Redleg grass)—*Claviceps pusilla* Cesati & *Cerebella* sp. (Ergot); Glen Innes.

Brachychiton acerifolia (Illawarra flame tree)—*Phytophthora parastica* Dast. (Root rot); Metropolitan Area.

Brassica juncea (Indian rape)—*Albugo candida* (Pers.) Kunze (white rust); Narrabri.

Brassica olearacea botrytis (Cauliflower)—*Alternaria herculea* (Ell. & Mart) Elliot (Grey leaf spot); West Fairfield.

Camellia magnoliaeflora (Camellia)—*Phytophthora cinnamomi* Rands (Root rot); St. Ives.

Castanea sativa (Chestnut)—*Phytophthora cinnamomi* Rands (Shoot blight and root rot); Metropolitan Area.

Ceratostigma willmottianum (Ceratostigma) Rosette condition (virus); Metropolitan Area.

Ceanothus edwardsii (Ceanothus)—*Phytophthora* sp. (Collar and root rot); Metropolitan Area.

Chamaelaucium uncinatum (Geraldton wax flower)—*Armillaria mellea* (Vahl) Quel. (Root rot); Gosford; and *Phytophthora cinnamomi* Rands. (Root rot); Metropolitan Area.

Chrysanthemum sp. (Chrysanthemum)—Greening (? virus); Metropolitan Area (observed for first time about 1942).

Cineraria hybrida (Cineraria)—*Verticillium dahliae* Kleb. (scald); Metropolitan Area.

Citrullus vulgaris (Watermelon)—*Erysiphe cichoracearum* D.C. (Powdery mildew); Yamba.

Citrus limonia (Lemon)—*Heterodera marioni* (Cornu) Goodey, (Root knot); Metropolitan Area.

Dianthus caryophyllus (Carnation)—*Phytophthora* sp. (Collar rot); Metropolitan Area.

Dichanthium sericeum (Queensland blue grass)—*Claviceps pusilla* Cesati and *Cerebella* sp. (Ergot); Guyra district.

Digitaria adscendens (Summer grass)—*Piricularia* sp. (Leaf spot); Metropolitan Area.

Diosma ericoides (Diosma)—*Phythophthora parasitica* Dast. (Root knot); Metropolitan Area.

Erica spp. (Heaths) — *Phytophthora cinnamomi* Rands. (Root rot); Metropolitan Area.

Eriostemon lanceolata (Eriostemon)—*Phytophthora cinnamomi* Rands. (Root rot); Pittwater.

Gilia coronopifolia (Ipomopis)—*Rhizoctonia solani* Kuehn. (Collar rot); Avoca; and Spotted wilt virus (Wilt), Mt. Colah.

Hippeastrum vittatum (Hippeastrum)—*Stagonospora curtisii* (Berk.) Sacc. (Red stripe disease); Lismore.

Ilex aquifolium (Holly)—*Phoma citricarpa* McAlp. (Leaf spot); Kurrajong Heights.

Ipomoea batatas (Sweet potato)—*Heterodera marioni* (Cornu) Goodey (Eelworm); Wollongbar.

Iris xiphium (Dutch Iris)—*Rhizoctonia solani* Kuehn. (Neck and root rot); Metropolitan Area.

Jacaranda mimosaefolia (Jacaranda)—*Phytophthora cinnamomi* Rands. (Collar rot, nursery stock); Metropolitan Area.

Lycopersicum esculentum (Tomato)—*Oidium lactis parasitica* Pritchard & Porti. (Watery rot); Mullumbimby.

Narcissus pseudo-narciosus (Daffodil)—*Stagonospora curtisii* (Berk.) Sacc. Leaf scorch); Robertson; and *Amillaria mellea* (Vahl.) Quel. (Bulb rot); Kurrajong Heights.

Olea europea (Olive).—*Cycloconium oleaginum* Cast. (Leaf spot); Metropolitan Area.

Oxalis sp. (Oxalis)—Oidium sp. (Powdery mildew); Metropolitan Area.

Papaver nudicaule (Iceland Poppy)—*Verticillium dahliae* Kleb. (Wilt); Metropolitan Area.

Passiflora edulis (Passion fruit)—*Rhizoctonia solani* Kuehn. (Damping off and basal stem rot of seedlings); North Coast.

Persea gratissima (Avocado)—*Phytophthora cinnamomi* Rands. (Root rot); Grafton.

Phalaris minor (Annual phalaris)—*Erysiphe graminis* D.C. (Powdery mildew); Leeton. Believed to have been present for many years.

Physalis peruviana (Cape gooseberry)—*Heterodera marioni* (Cornu) Goodey (Root knot); Metropolitan Area. First observed in 1941.

Pistacia chinensis—*Phytophthora cactorum* (L. & C.) Schrod. (Root rot); Metropolitan Area.

Pimelea hirsuta—*Cercospora* sp. (Leaf spot); Pittwater.

Plumieria acutifolia (Frangipanni)—*Oidium* sp. (Powdery mildew); Metropolitan Area.

Poa bulbosa—*Uromyces* (?) *poae* Rabh. (Rust); Orange.

Poa pratensis (Kentucky blue grass)—*Puccinia poarum* Niels. (Leaf rust); Guyra.

Prostanthera ovalifolia (Mint bush)—*Phoma* sp. (Stem girdle); *Sclerotium rolfsii* Sacc. (Collar rot); Metropolitan Area.

Raphiolepis indica (Indian hawthorn)—*Fabraea maculata* (Lev.) Atk. (Freckle); Dural.

Rosax indica (Noisette) — *Chalaropsis thielavioides* Peyr. (Black mould); Metropolitan Area. Probably present for many years.

Rosa multiflora (Multiflora stock)—*Verticillium dahliae* Kleb. (Die back); Carlingford.

Rumex obtusifolius (Dock)—*Ustilago* (?) *lagerheimii* Bref. (Smut); Green Valley.

Rubus sp. (Boysenberry)—*Verticillium dahliae* Kleb. (Die back); Metropolitan Area.

Salpiglossus sinuata (Salpiglossus)—Spotted wilt virus (die back); Mt. Colah.

Schizanthus pinnatus (Schizanthus)—*Oidium* sp. (Powdery mildew); Metropolitan Area.

Sida rhombifolia (Sida)—*Sclerotinia sclerotiorum* (Lib.) Mass. (Stem rot); Lisarow.

(Continued on page 46.)

APPLE ROOT-STOCK INVESTIGATIONS

Testing English Stocks at Bathurst.

A PROGRESS REPORT.

J. D. BRYDEN, Special Fruit Officer.

THE comprehensive apple root-stock investigations at Bathurst Experiment Farm include a section devoted to the testing of a number of English stocks selected at the East Malling Research Station. This report records the progress of the trials with East Malling stocks to 1946, and indicates various trends in growth and yields which have been observed or are becoming apparent in the trees at twelve years old. Some years will elapse before the tests can be regarded as complete.

Objects of the Trials.

The tests were designed to give detailed information over an extended period of the behaviour of the particular root-stocks in respect of: (*a*) suitabilty to Australian conditions generally and particularly to fairly rigorous climatic conditions; (*b*) compatibility, growth and yields when Jonathan, Delicious, Democrat and Granny Smith were used as scion varieties; and (*c*) relative performances of East Malling, Northern Spy and seedling roots for apples. In this series of tests Northern Spy stock has been used as a standard for comparison.

The English stocks used were obtained direct from East Malling and comprised the types E.M. 1, E.M. 12, E.M. 13, E.M. 15 and E.M. 16. Owing to a shortage of material it was not possible to include a complete range of stock-scion combinations with East Malling stocks. Consequently the following had to be omitted from the trial:—Jonathan/E.M. 15; Democrat/E.M. 15; Granny Smith/E.M. 1; Delicious/E.M. 1. Trees of Delicious on seedling were not available for inclusion in the trial.

Northern Spy stocks were vegetatively raised from a local clone, while the seedling roots were obtained from open pollinated material.

The trees were propagated at the departmental nursery at Narara, New South Wales, the East Malling and Northern Spy stocks being budded to the various scion varieties. Those on seedling roots were propagated as root-grafts.

District and Climate.

Bathurst is situated in undulating country on the western slopes of the Great Dividing Range. The Experiment Farm lands are approximately 2,200 feet above sea level and during the twelve years covered by this report the average annual rainfall has been about 20 inches. Drought conditions from time to time during the period 1937-46 have been responsible for a relatively low annual average for this ten-year period.

The greater portion of rain received usually falls in the winter months, and summer conditions are normally warm and dry. The trees in this trial have received no supplementary irrigation.

The soil is of granitic origin with loams 6 to 9 inches deep overlying a gravelly clay of medium light texture.

The Trial Plots.

The trees were square-planted 24 feet apart in 1934 The planting was arranged in groups according to scion varieties, with the various stock combinations randomised.

Records.

Tree growth and development has been regularly recorded by trunk measurement. In addition, figures representing the product of height x width of trees have been recorded from time to time to further indicate comparative development. Complete details of yields and quality of fruit are also recorded.

Tree Growth and Development.

Details of tree growth and development recorded in 1946 when the trees were twelve

years old are presented in Table 1. The **information** is also given in graph form **(Fig. 1)**.

TABLE 1.—TREE GROWTH AND DEVELOPMENT, 1946.

Stock.	Growth and Development.		Index N. Spy = 100.	
	Mean trunk measurements (mm).	Mean size of tree (Height x Width).	Trunk.	Size.
	Granny Smith.			
Northern Spy ...	321	101	100	100
Seedling ...	400	126	124	124
E.M. 16 ...	314	117	98	115
E.M. 13 ...	335	107	104	105
E.M. 15 ...	344	106	107	105
E.M. 12 ...	329	107	102	105
	Democrat.			
E.M. 1 ...	315	118	104	106
Northern Spy ...	300	110	100	100
Seedling ...	368	119	122	108
E.M. 16 ...	300	105	100	95
E.M. 12 ...	328	120	109	108
E.M. 13 ...	303	110	101	100
	Delicious.			
E.M. 16 ...	309	108	108	110
E.M. 13 ...	305	106	106	108
Northern Spy ...	286	98	100	100
E.M. 15 ...	311	101	108	103
E.M. 12 ...	292	101	101	103
	Jonathan.			
E.M. 1 ...	321	126	106	106
Seedling ...	325	121	107	102
Northern Spy ...	302	118	100	100
E.M. 13 ...	339	135	112	115
E.M. 16 ...	297	116	98	98
E.M. 12 ...	322	122	106	103

The data for growth and development as indicated by trunk measurements show that with the exception of Democrat/Seedling and Granny Smith/Seedling, there were no marked differences in size of tree at this stage, either within the various groups of varieties or in the whole series of combinations.

The figures reveal that in each case where Northern Spy is the root-stock, the trees are relatively smaller. The stock E.M. 16 has so far also produced trees smaller than average, except where Delicious was the scion variety, in which case E.M. 16 has produced the largest trees in the group.

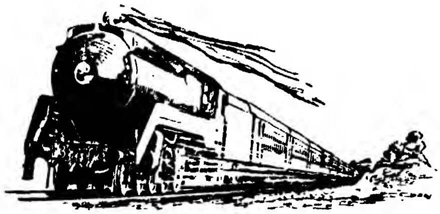
No other stock shows consistent behaviour in influencing tree size and development.

Cropping.

With regard to fruit production, Northern Spy and E.M. 16 stocks induced earliest cropping in all varieties, although this character was less pronounced with Democrat. In contrast E.M. 12, and to a slightly less extent E.M. 15, were slow to produce crops. In combination with Granny Smith and with Democrat, E.M. 12 showed a distinct tendency towards late bearing.

TABLE 2.—MEAN AGGREGATE YIELDS PER TREE, 5-YEAR PERIOD, 1942-46.

Variety.	Stock.	Mean Yield Per Tree.		No. Fruits per lb.	Index—Spy 100.		Approximate Bushels Per Tree (42 lb. basis).	Estimated Yield Per Acre (75 Trees).
		Weight.	No. Fruits.					
		lb.			lb.	No.		bus.
Granny Smith ...	N. Spy ...	417	1,356	3.2	100	100	9.92	745
	Sdlg. ...	292	905	3.1	70	66	6.95	522
	E.M. 16...	179	608	3.4	43	44	4.26	319
	E.M. 13...	149	476	3.1	35	35	3.55	266
	E.M. 15...	84	586	6.9	20	43	2.00	150
	E.M. 12...	51	217	4.2	12	16	1.23	92
Democrat	E.M. 1 ...	452	1,491	3.3	132	127	10.76	805
	N. Spy ...	342	1,172	3.4	100	100	8.14	611
	Sdlg. ...	258	894	3.4	76	76	6.14	461
	E.M. 16...	232	922	3.9	68	70	5.52	414
	E.M. 12...	220	882	4.0	64	75	5.24	393
	E.M. 13...	218	698	3.2	64	59	5.19	389
Delicious	N. Spy ...	187	694	3.7	100	100	4.45	333
	E.M. 16...	169	665	3.9	90	96	4.02	301
	E.M. 13...	128	504	3.9	68	72	3.04	228
	E.M. 15...	105	505	4.7	56	72	2.5	187
	E.M. 12...	101	413	4.0	54	59	2.4	180
Jonathan	E.M. 1...	399	2,188	5.4	121	117	9.5	713
	Sdlg. ...	340	1,580	4.6	103	84	8.09	607
	N. Spy ...	329	1,864	5.6	100	100	7.83	587
	E.M. 13...	313	1,440	4.6	95	77	7.45	559
	E.M. 16...	305	1,756	5.7	93	94	7.26	545
	E.M. 12...	197	1,088	5.5	60	58	4.69	351



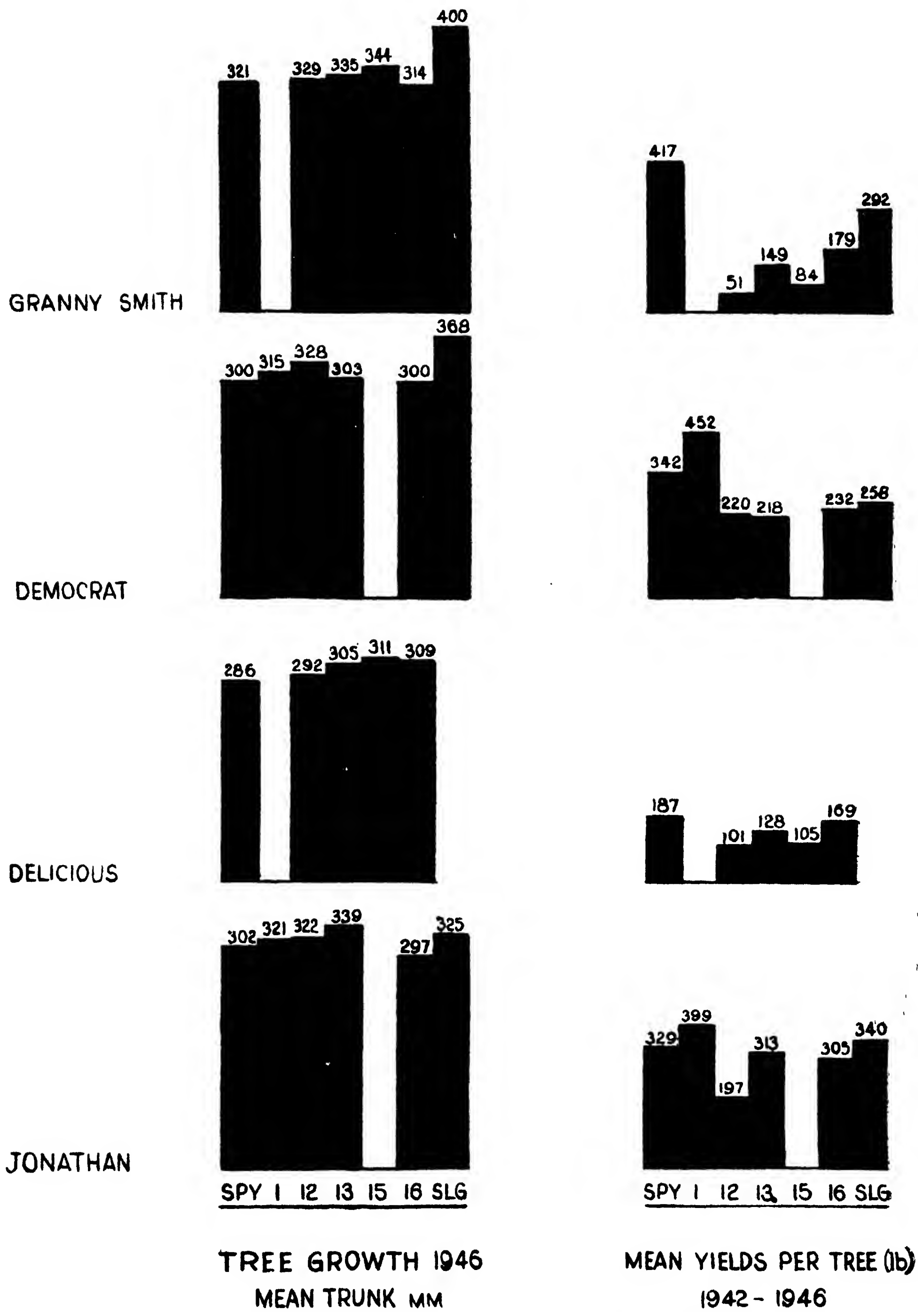


Fig. 1.—Graphs showing Tree Growth and Development as at 1946, and (on the right) Average Yield per Tree 1942–46.

TABLE. 3—ANALYSIS OF CROPS—SIZE AND QUALITY, 1944.

Stock.	Extra Fancy.			Fancy.			All Other.
	Small.	Medium.	Large.	Small.	Medium.	Large.	
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
			Granny Smith.				
Northern Spy... ...	...	...	...	9.3	87.6	3.0	...
Seedling	...	...	...	12.2	85.5	2.1	...
E.M. 16	...	...	...	19.7	76.8	0.2	...
E.M. 13	...	...	...	3.8	77.7	18.3	...
E.M. 15	...	...	...	56.2	43.6	...	...
E.M. 12	...	...	...	97.3	2.2	...	...
			Democrat.				
E.M. 1...	20.4	34.5	...	5.8	9.1	...	29.6
Northern Spy... ...	30.6	30.9	...	7.2	8.1	...	23.0
Sdlg.	25.2	40.5	...	3.4	8.4	...	21.9
E.M. 16	30.7	14.9	...	16.0	8.7	...	23.8
E.M. 12	30.0	21.6	...	7.5	5.2	...	26.4
E.M. 13	11.4	46.9	3.5	2.5	9.8	...	25.6
			Delicious.				
E.M. 16	28.1	4.9	...	57.1	1.0	...	8.9
E.M. 13	27.5	20.5	...	36.2	6.2	...	9.2
Northern Spy... ...	29.4	18.5	...	36.2	4.9	...	10.9
E.M. 15	44.8	4.5	...	43.7	1.0	...	6.5
E.M. 12	26.1	10.6	...	55.0	2.0	...	6.1
			Jonathan.				
E.M. 1...	14.6	60.5	...	3.1	3.7	...	17.8
Sdlg.	6.3	51.0	5.2	3.6	14.8	0.8	18.0
Northern Spy... ...	10.7	67.2	1.0	3.8	4.4	...	12.6
E.M. 13	3.2	69.3	2.8	2.5	8.3	...	13.2
E.M. 16	19.4	46.1	1.1	10.8	9.9	...	12.6
E.M. 12	20.0	58.2	...	7.3	4.9	...	8.5

Colour Quality :—

Democrat.—Extra Fancy 90 per cent. colour; Fancy 50 per cent. colour.

Delicious and Jonathan.—Extra Fancy 75 per cent. colour; Fancy 20 per cent. colour.

Size Classification :—

Jonathan.—Small, under $2\frac{1}{4}$ inches; medium, $2\frac{1}{4}$ inches to $2\frac{3}{4}$ inches; large, over $2\frac{3}{4}$ inches.

Granny Smith, Democrat and Delicious—Small under $2\frac{5}{8}$ inches, medium $2\frac{5}{8}$ inches to 3 inches, large, over 3 inches.

Differences in comparative bearing age between the stocks was least pronounced where Jonathan was the scion variety.

The mean aggregate yields per tree from the various stock-scion combinations for the five-year period 1942-46 are presented in Table 2. This data shows the average tree performances for what can be regarded as the first stage in full bearing. Details of yields are also shown in Fig. 1.

It will be noted that Granny Smith on Northern Spy roots produced much greater yields than other stocks. East Malling stocks with Granny Smith were decidedly poor, and E.M. 12 particularly so.

With Democrat, high yields were obtained where the trees were on E.M. 1 stocks, and Democrat on Northern Spy gave good results. East Malling stocks, other than E.M. 1, produced similar amounts of fruit in Democrat combinations for the five-year period under review.

Jonathan trees on the various stocks showed greater average yields per tree generally, and less marked variation in stock-scion performances, although E.M. 1 produced greater quantities of fruit and E.M. 12 considerably less than others.

Yields from Delicious trees were relatively poor and this was in conformity with usual results from Delicious in this district. Northern Spy was superior to other stocks used in combination with Delicious.

Quality of Fruit.

An analysis of the crops showing size and quality of the fruit produced by the various

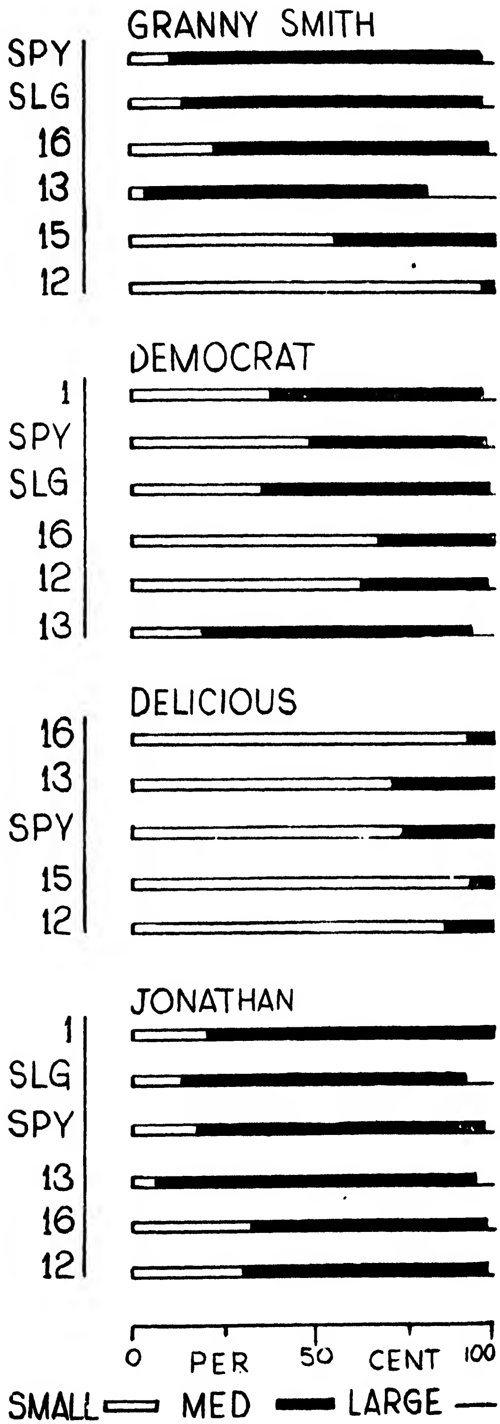


Fig. 2.—Graph of Size of Fruit, 1944.

combinations in 1944 when the trees were ten years old is furnished in Table 3. The 1944 figures are selected for this data, as in that year all varieties produced heavy yields. The information presented gives details from which comparisons may be drawn, both within the variety groups and over the whole series. The sizes conform to popular market and export classifications, while the colour quality categories are those used in marketing all fruit from the Bathurst root-stock investigations, and are above present regulation standards. Details of size of the fruit from the various combinations in 1944 are shown graphically in Fig. 2, and the colour quality is presented in Fig. 3.

Granny Smith, a green variety, was not, of course, graded for colour, but it is interesting to note that Northern Spy stock which produced the greatest yields also produced good size in that year, while the Granny Smith/E.M. 12 combination had the smallest crop and the smallest fruit. The comparatively large size of apples from Granny Smith/E.M. 13 was offset by relatively poor cropping.

With Democrat as the scion variety, E.M. 13 showed superiority in both colour and size. The stocks E.M. 16 and E.M. 12 produced greater proportions of small-sized fruits than other stocks used with Democrat.

Delicious apples grown in the Bathurst district usually do not attain a high degree of colour, so that the performances of E.M. 13, Northern Spy and E.M. 15 so far as colour was concerned was reasonably satisfactory. It will be noted, however, that all Delicious combinations except E.M. 13 and Northern Spy produced large proportions of fruit considered as small.

In the case of Jonathan, where the size standard is lower than other varieties, E.M. 13 and Northern Spy again exhibited superiority in the qualities of size and colour. Jonathan on seedling stock showed an ability to produce apples of larger size than other combinations, but the fruit was not so well coloured.

Regularity of Cropping.

Biennial bearing occurred to some extent in all stock-scion combinations, although Northern Spy showed a greater tendency towards this character than other stocks included in the trial. This was in evidence in

Northern Spy with all varieties. Democrat/E.M. 1; Delicious/E.M. 15; and Delicious/E.M. 16, also showed a pronounced alternate bearing habit.

Discussion.

It is much too early to attempt to draw definite conclusions from the results of the trial to date. Northern Spy has given fairly satisfactory results during this early bearing period. The information obtained confirms the knowledge already held regarding the high degree of compatibility exhibited by Northern Spy when used in combination with most varieties of apples.

As far as growth and development are concerned the East Malling stocks show no outstanding features at this stage. It is possible that during the next five-year period, greater differences in growth and tree size will become apparent as a result of the influence of fruit production.

It is interesting to note that there is considerable variation in the behaviour of East Malling stocks when different scion varieties are used. This indicates differing degrees of compatibility and points to a definite influence of scion over stock.

It would seem that ultimately seedling roots will produce a much larger tree than any other of the stocks tried.

In cropping, the East Malling stocks showed a more consistent behaviour. E.M. 1 has been superior to others in the two combinations tried and E.M. 16 produced greater yields than most other East Malling stocks with all varieties.

In practically all cases E.M. 12 has shown poor cropping ability to this stage. The poor results in growth and yields so far achieved with E.M. 12 and E.M. 15 suggest that these stocks are unsuitable under conditions similar to those prevailing at Bathurst.

Granny Smith trees worked on East Malling stocks seem to be inferior in most respects when compared with those on Northern Spy and seedling roots.

A feature of the results to date is that Northern Spy combinations have maintained comparatively good size in fruit, despite the fact that this stock is amongst the highest producing combinations.

East Malling stocks have shown no ability to impart outstanding characteristics in size of fruit and colour quality.

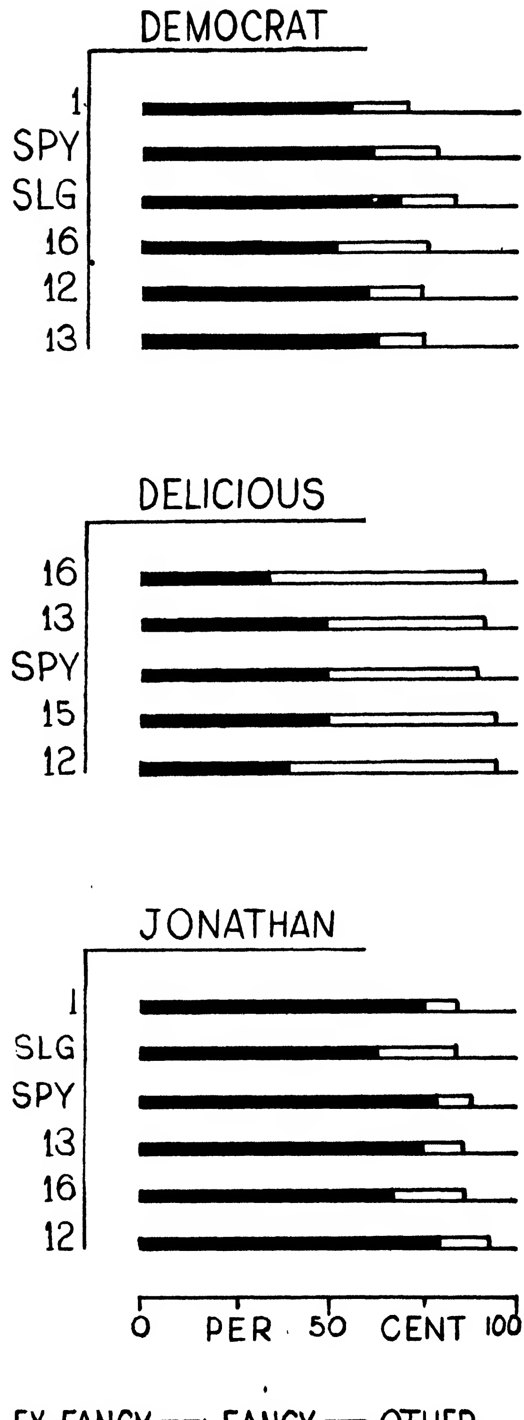


Fig. 3.—Color Quality of Fruit

INSECT PESTS.
Notes contributed by the Entomological branch.

Red Scale (*Aonidiella aurantii*).

THE red scale is present in all the main citrus-growing areas, and is the most injurious scale pest of citrus trees in the inland districts and some parts of the coastal regions of this State. It infests the leaves, fruit, twigs and branches, and where uncontrolled, may cause the branches to die back. Eventually, the injury to the trees may be so severe that they become entirely unproductive.

In addition to attacking citrus trees, it also infests a wide range of other trees and shrubs, including mulberry, willow, holly, rose, grape, privet, etc.

It is a cosmopolitan insect, and takes its popular name from the reddish colour of the thin, protective secretion or scale which is formed over its body. The insect develops beneath this covering and obtains its food by sucking the sap from the plant tissues.

The adult female scale covering, which has a diameter of about one-sixteenth of an inch, is roughly circular in outline and slightly raised in the centre.

Living six-legged young or "crawlers" are produced, and these, on emerging from beneath the parent scale, crawl about for several days before they settle down and commence feeding.

The female insect remains permanently in the one place for the rest of its existence, and after casting its skin twice during growth, reaches its adult stage. The male scale casts its skin four times and emerges as a minute two-winged insect, which is orange-yellow in colour. The male scale covering, after the insect's first moult, is elongate.

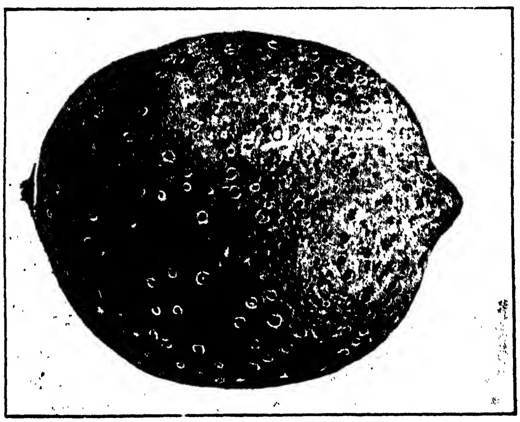
The average period from the birth of the female until the production of the next generation of living young is about three months, but during the winter the development is greatly retarded, and a much longer period may elapse. The fertilized adult females may continue to produce young for a period of one or two months and the average number of young from an individual female is about fifty-five. Considerable overlapping of the broods takes place, and although the maximum production of the young occurs during the summer months, scales in all stages of growth may be found at almost any time of the year.

Control.

Where the trees are heavily infested with this scale, the first objective should be to reduce the amount of infestation to a minimum, in the shortest possible time, and sufficiently early in the season to allow the fruit, during growth, to throw off the scales by harvesting time. Control measures are usually carried out from mid-December to March, and for this purpose spraying or fumigation may be undertaken.

Spraying.

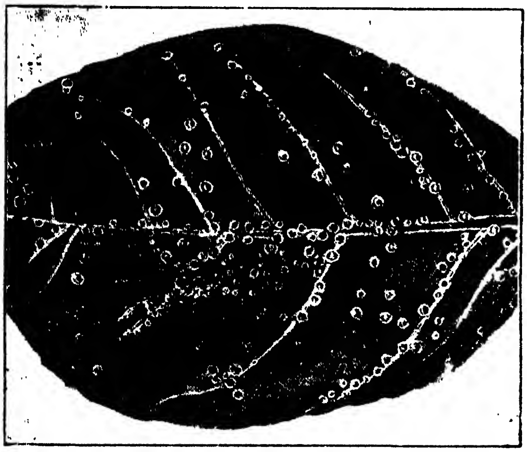
The sprays recommended for red scale are oils, and those at present in general use



Lemon Infested with Red Scale.

are of two main types usually known as white oils and red oils. The white oils are the safest to use, being much less likely to damage the fruit or foliage. Late applications of oil should be avoided as they are likely to cause a reduction of the crop the following season. Oil sprays applied during the heat of the day, in hot sunny weather, may cause injury. Trees in a weak or drought-stricken condition are much more susceptible to injury than normal healthy trees.

It is essential that the spray be applied thoroughly and that an adequate quantity be used so that all parts of the tree are thoroughly wetted. It is advisable also to prune out all spent and useless wood from the trees.



Citrus Leaf Infested with Red Scale.

Both white and red oils are generally used at a dilution of 1 gallon of oil to 40 gallons of water (16 fluid ounces to 4 gallons), but any higher concentration than this may injure the trees.

Where red scale infestation is heavy, it may be necessary to adopt a double treatment in order to obtain a satisfactory "clean-up" of the scale. For this purpose, either a double oil spray, or a combination treatment, in which oil spraying is followed by fumigation, may be used.

The double spray method is more suitable for coastal districts, whereas the spray-fumigation treatment has been found more satisfactory in inland areas.

Where the double oil sprays (1 to 40) are used, the first application is usually made about mid-December and the second in mid-February. These sprays, in addition to controlling red scale, also effectively control white wax, purple and brown scales and the citrus rust mite.

Much better results, however, have been obtained in the control of red scale by two applications of half-strength oil sprays (1 gallon of oil to 80 gallons of water; 8 fluid ounces to 4 gallons) with a short interval, preferably only one or two days, between them. This method will be found particularly useful in controlling persistent infestations of red scale on heavily-infested trees in orchards and home gardens.

Experiments have demonstrated that two half-strength oil sprays (1 in 80) applied in the January-February period, with an interval of one or two days between, followed in March by fumigation, is a very efficient method of controlling this scale in the Murrumbidgee Irrigation Area. Although the oil sprays may be applied before or after fumigation, it is recommended that the spray application should precede the fumigation by about two weeks.

Fumigation.

Three methods of fumigation with hydrocyanic acid gas may be employed:

1. The "pot" or wet method, in which sulphuric acid, diluted with water, is allowed to act on sodium or potassium cyanide to produce the gas.

2. The "dry" method, which consists of blowing calcium cyanide dusts of various types under the tent, where the gas is evolved from the dust on exposure to the atmosphere.

3. That in which liquefied hydrocyanic acid gas is sprayed into the tent space.

Details of these methods of fumigation are given in a Departmental pamphlet on "Fumigation for the Control of Scale Insects of Citrus Trees."

Parasites and Predators.

Several species of chalcid wasp larvae develop within the bodies of red scales, and these include *Aphytis chrysomphali* and *Aspidiotiphagus australiensis*. A number of species of scale-eating ladybirds also attack the red scale, and these include the steely-blue ladybird *Orcus chalybeus* and another

dark-blue species with six orange-coloured spots, *O. australasiae*. These parasites and predators, however, are only of limited value in reducing scale infestations.

Control Measures are Compulsory.

Treatment for the control of red scale is compulsory under the provisions of the Plant Diseases Act.

Springtails (*Collembola*) and Benzene Hexachloride.

SMALL white springtails, and others, often occur in considerable numbers in the soil. They occur most commonly in moist situations and are found in decomposing wood, leaf-mould and most other forms of decaying organic matter upon which they feed.

They are often found feeding in various bulbs and corms in the soil, but usually in these instances, some primary injury or disease condition, which may have provided additional moisture, has first attracted the springtails from the adjacent soil, and they are merely feeding on the injured or rotting tissues. They are frequently found in great numbers about various seeds which have failed to germinate and have decayed in the soil.

Under certain conditions, however, springtails may attack various kinds of seeds planted in the soil, or destroy the growing tips of recently-germinated seeds and the delicate foliage of growing plants.

Nicotine sulphate and soap solutions, and under some conditions, lime-sulphur solutions have been commonly used for their control. D.D.T. has been tested and found to be ineffective even in high concentrations of dust when applied to the soil surface.

In some recent tests with insecticides* for the control of the small white springtail (*Onychiurus fimetarius*), in decaying straw material under fruit trees, the following substances were used:—Naphthalene, paradichlorobenzene, hexaethyl tetraphosphate, and benzene hexachloride (B.H.C. or "666").

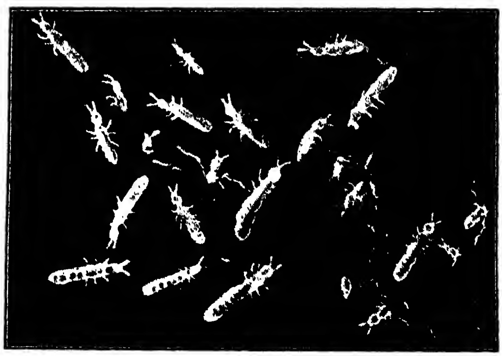
The most effective of these insecticides was benzene hexachloride. Control of the springtails in the straw material was obtained with this chemical at a concentration of 0.2 per cent. suspension of dispersible powder, applied at the rate of 1 pint per square foot.

A suspension of this powder, at a concentration of 0.2 per cent. applied at the rate of 3 gallons per square yard had a residual effect for at least two weeks.

A benzene hexachloride spray at a concentration of 0.1 per cent. was applied to a seed-bed of cabbages in sufficient quantity to wet the soil as well as the plants. This spray caused no injury to the seedlings and gave at least a week's protection.

In the above tests both the naphthalene and the paradichlorobenzene were effective in controlling the springtails when mixed into the straw at the rate of 2 oz. per square foot, but were relatively slow in their actions.

The hexaethyl tetraphosphate, used in a 0.4 per cent. solution at the rate of 1 pint per square foot, was completely ineffective.



Common White Springtails (magnified).

Soils containing various amounts of benzene hexachloride were also tested and concentrations of 0.0125 and 0.025 per cent. isomers showed promise of possible use for seedlings or potting purposes.

* Unpublished reports of experiments conducted at Willoughby by Mr. A. H. Friend, Assistant Entomologist.

Removal of Residues from Spray Tanks.

WHILE most growers realise that certain chemicals used as insecticides and fungicides cannot be used safely in combination, there are some who do not realise the importance of thoroughly emptying and cleaning out spray tanks after use. Such growers may either only incompletely clean the tanks or carelessly leave them unwashed.

This may lead to chemical reaction when next using some other spray material, and may result in considerable "burning" of the plants, or other damage, when the spray is applied. Such injuries are frequently attributed to the insecticide which, in itself, would have been harmless to the plants had care been taken to clean out the spray tank.

Where spray equipment is used for general purposes, such as the application of "weed-killer" sprays, as well as for orchard or vegetable crop sprays, particular care should be taken to ensure that the spray tanks are thoroughly cleaned after use, and that no spray mixture residues are allowed to remain in them.

The tank should be washed out with clean water, and clean water should be pumped through the hose after use. Where oil has been used soda should be dissolved in the water used for rinsing.

A Correction.

IN the previous issue of this Gazette, in which the control of meat or road ants with "666" was recorded in "Insect Pest Notes," the scientific name of the ant should read *Iridomyrmex detectus*.

The Business of Farming—*continued from page 20.*

The resultant comparable prices are shown in the following table:—

	Ground Lime.		Quick Lime.		Slaked Lime.	
	s.	d.	s.	d.	s.	d.
100 miles	40	0	44	7	41	3
200 miles	42	0	45	11	42	9

From this table it can be seen that in this example a farmer living near a railway station which is 200 miles or less distant from the nearest lime works should use ground lime as the cheapest form of lime available.

So far road transport costs have not been taken into account. Where lime has to be carted by a contractor these costs are usually rather high. The relative cost of the various forms of lime landed on the farm can be worked out in exactly the same way when costs of road transport are included.

At present relative prices of various forms of lime and of railway and road transport costs, ground lime is the cheapest form of lime in most districts, but when the distances over which the lime has to be carried become very great, especially where long road hauls are necessary, some more concentrated form of lime than ground lime will be found cheaper.

Plant Diseases—*continued from page 36.*

Statice sinuata (Statice)—*Phytophthora* sp., and *Sclerotium rolfsii* Sacc. (Crown rots); Wyong. Spotted wilt virus (die back); Metropolitan Area, Liverpool, Wyong.

Syringa vulgaris (Lilac)—*Phytophthora parasitica* Dast. (Root rot); Leeton.

Trifolium glomeratum (Clustered clover)—*Peronospora* sp. (Downy mildew); Narara.

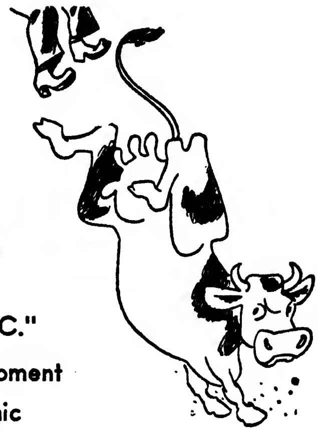
Urtica dioica (Nettle)—*Septoria* sp. (Leaf spot); Leeton.

Virgilia capensis (Virgilia)—*Armillaria mellea* (Vahl.) Quel. (Root rot); Metropolitan Area.

Vitis clematidea—*Xanthomonas* sp. (Bacterial leaf spot); Metropolitan Area.

Zantedeschia aethiopica var. *minor* (Calla lily)—*Bacterium aroideae* (Corm rot); Metropolitan Area.

Zinnia elegans (Zinnia)—*Alternaria zinniae* Pape (Leaf spot); Mt. Colah.



Proof that—

HERD RECORDING PAYS

Associated with Correct Feeding.

Hunter River Dairyman's Result.

J. W. G. SMITH, Dairy Officer.

HERD recording for production is becoming very popular in the Hunter Valley area, and numbers of dairy farmers are becoming interested.

Because of the bad seasons that have been experienced in this district during the past fifteen years—with one or two fair seasons intervening—many farmers have gone in for irrigation and the laying down of permanent pasture and lucerne areas. This, coupled with better feeding methods has brought about an increase in milk production, despite the bad seasons.

Hunter River dairymen are realising that it does not pay to feed cows that will not return more than the value of the food they consume, and feeding cows according to their capacity to produce is now more commonly practised. These farmers have also learnt during the bad seasons and as the result of fluctuations of prices for dairy products, that it does not pay to waste feed when it is scarce—and concentrates for dairy herds have been in short supply and costly for a number of years now.

Among the Hunter River dairy farmers who are keen on herd recording for production—which enables feeding according to production—is Mr. J. B. Boag of Seaham. The performance of his herd is worthy of special mention because of the remarkable production over the last recording year, October, 1946, to September, 1947. The example set is well worth following by other dairy farmers.

The Monthly Total and Average Yields.

The following figures for each month taken from Mr. Boag's record sheets show the actual number of cows milking each month, their totals and average.

1946.	No. of Cows Milking.	Total Yield Per Day.	Average Yield per cow Per Day.
		lb. Milk.	lb. Milk.
October	34	807	23·7
November	40	881	22·0
December	41	861·5	21·0
1947			
January	33	707	21·4
February	33	620	18·8
March	35	787·5	22·5
April	37	839·5	22·68
May	32	835	26·09
June	36	1026	28·50
July	43	1335	31·04
August	43	1449	33·69
September	46	1468·5	31·92

From the table it will be seen that the herd averaged 25.2 lb. of milk per day for each month.

The total number of cows shown on the record sheets is 73; that is, 73 cows' names have appeared on the monthly record sheets, but the highest number in any one month was 44. Of the cows recorded, 24 were cows on their first calf, and 49 on second, third and fourth calf, whilst two only were aged cows. It will be seen that the herd must have had fresh cows in each month.

The herd is comprised of Ayrshire grades, all bred on the farm. Mr. Boag has been purchasing pure-bred Ayrshire sires from well known breeders of high producers for over twenty years.

Selected Heifers, Pure-bred Sires and Correct Feeding.

The high production of this herd is the result of:—(1) applying the results of herd recording in the selection of the heifer calves retained in the herd; (2) the use of sires of known high-production strain; and (3) the correct feeding of the cows both when dry and milking, and of the calves retained.

Mr. Boag does not keep low producers, because he has none. Every cow is bred on

production lines, and is well reared from a calf.

Mixed pastures have been laid down in a number of paddocks and they are systematically fed off. When feeding on good pastures, the cows are given either a low protein concentrate meal or roughage such as silage or cereal hay. When pastures or green crops are losing protein value, high protein concentrates or roughage such as lucerne hay are fed, as far as possible according to the production of each cow.

Cost of Feeding Amply Repaid.

It is hard to work out accurately the cost of feeding concentrates to the herd because different concentrates were purchased when available at different prices. Assuming concentrates cost £13 a ton average, it cost Mr. Boag 7½d. a day per cow at the peak feeding season and 3½d. a day during the flush season when pastures were good. With the prices for milk ruling over the period, these cows amply repaid Mr. Boag for all fodder used.

Yanco Welfare Farm.

Transferred to the Department of Agriculture.

THE Premier (Hon. James McGirr, M.L.A.) has decided that the Riverina Welfare Farm, Yanco, which is under the control of the Department of Education, is to be handed back to the Department of Agriculture for use as an experiment and research farm.

Commenting on this decision, the Minister for Agriculture, Mr. Graham, said that use of this establishment would prove invaluable for investigational and research work into irrigation problems, and production of crops and stock under irrigation farming conditions.

The Yanco Farm would be used also as a training centre for ex-servicemen. Later it was hoped to provide at this farm a two or three years' course in irrigation farming.

With the concurrence of the Department of Education, agronomists stationed at the farm during the past year had already commenced investigational work on crops and pastures. For example, the Riverina Welfare Farm had been used for production of pure seed of several promising varieties of grain sorghum which the Department had introduced from America. Experiments had also been commenced with such crops as cotton, soybeans, peanuts, linseed and safflower, and 30 acres of irrigated pasture experiments had been laid down.

Establishment of rice-growing on unsatisfactory soils in the past presented a big problem on the Irrigation Area, said the Minister. A change-over to other forms of agricultural production was the answer. How best that could be done, and done profitably from the farmer's point of view, would be one of the main projects of the Yanco Farm.

A start had already been made with the raising of out-of-season fat lambs on irrigated areas. Large-framed Merino ewes were being mated with Romney Marsh, Dorset Horn and Border Leicester rams. The ewe progeny of those crosses would be mated with the rams of the Down Breed. The Berkshire pig stud now on the farm would be used for production of breeding stock and for pig recording work.

Orchard irrigation and drainage practices, cultural and propagation experiments, pests, disease and weed control were among the fruit-growing projects planned for Yanco Farm.

Use of Honey in Fruit Fly Spray is Illegal.

DURING periods of sugar shortages, some fruit growers have occasionally made use of honey as a substitute for sugar in the poisoned spray bait used for the control of fruit fly.

Honey mixtures are more likely to be attractive to bees during times when there is a shortage of natural food for bees in the field, and there is consequently a danger of bees feeding on poisoned sprays containing honey applied for fruit fly control.

In addition to this danger, however, there is a risk of serious brood diseases of bees being spread by the use of honey in such sprays. This is particularly the case if the honey is left exposed to robber bees which may be attracted to it in the shed where the spray is mixed. The spores of American Foul Brood disease (*Bacillus larvae*) may be present in honey extracted from any diseased hive. Whilst these spores are not in any way harmful to human beings, they develop when fed to bee larvae in the brood of the hive. For this reason a clause has been included in the Apiaries Act which provides for a penalty of up to £20 for any person exposing honey which attracts robber bees.

Special allocations of sugar have been arranged to enable growers to obtain supplies for use in fruit fly control operations. Particulars may be obtained from the Departmental Fruit Inspectors.

The formula for the spray bait as recommended consists of 2 oz. tartar emetic, 2½ lb. sugar, 4 gals. water.

Poultry Notes.

January, 1948.

E. HADLINGTON, Principal Livestock Officer (Poultry).

THE OUTLOOK FOR 1948.

ALTHOUGH the average price of eggs during the year just closed was somewhat higher than in the previous year, the increase did not keep pace with the greater cost of production. Thus producers dependent upon egg production alone experienced a lean year.

However, there are indications that there should be some improvements in the coming year.

In the first place, the record harvest of wheat and oats should ensure adequate feed supplies especially of mill offals, and this will tend to reduce feed costs provided there is no increase in the price of cereals for stock feeding. The only doubt about the mill offal supply concerns the ability of the millers to keep flour supplies moving out, thus enabling them to work to full capacity. With increased supplies of mill offals the producer can effect a considerable saving in the cost of the mash portion of the rations by substituting pollard and bran for a large proportion of ground grains, and this will also reduce the amount of protein supplements required.

On the marketing side the lifting of control over wholesale ceiling prices of eggs and live table birds should result in improved returns over the year. Thus, with some reduction in cost of feeding and a higher average price for eggs, the prospects are more re-assuring than for some time past. In addition, where conditions permit, the revenue of the farm might be augmented by the production of at least some table birds.

Raising Table Poultry.

It appears almost certain that although there may still be some restriction on the quantity of wheat made available for stock feed, there will be sufficient cereals, plus mill offals, to enable the raising of cockerels for market where practicable. However, with a large increase in the number of birds raised for market, it is to be expected that values will recede somewhat, although while the agreement with the British Ministry of Food continues, it is unlikely that there will

be any drastic slump in prices, provided that good quality birds are produced.

This means that those who wish to undertake the production of market birds should make sure that they are given conditions equal to those under which the pullets are raised, and that late hatching of cockerels must be avoided. No attempt should be made to raise cockerels unless adequate rearing accommodation is available, as any over-crowding will result in poor development of both pullets and cockerels.

Those who attempt cockerel production should commence as early as possible, preferably about May and put the last batch of cockerels in the brooders not later than mid-August. Those who have facilities for putting through a batch of cockerels or mixed sexes during the late summer or early autumn, should find it a profitable venture, as the cockerels will find a ready market when three to four months old, and the pullets will assist in increasing production next summer, thus enabling more eggs to be exported to Britain.

Of course, many of the eggs from the autumn pullets will not be large enough for export, but they can be used for local trade, thus allowing other eggs to be exported.

Britain requires all the eggs that we can send, and it appears likely that in order to obtain the maximum quantity the price factor may be reviewed. In any case, in view of the decline in production since June last, every effort should be made to keep up supplies for export.

Limitations of Autumn Hatching.

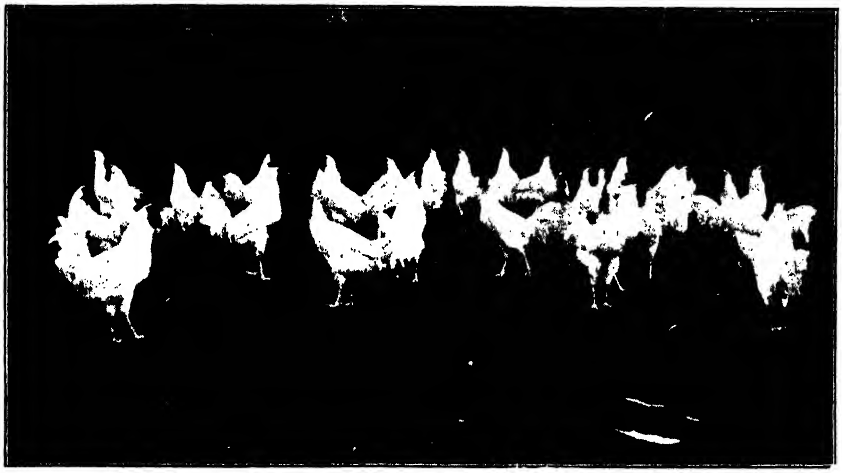
The first consideration when deciding whether to undertake the rearing of chickens during the late summer or autumn is whether the birds can be raised on clean ground, as any attempt to run chickens over the ground recently used for the spring chickens will most likely result in heavy losses in rearing, and also contaminate the runs for the next spring rearing. Those who have runs available which have been spelled for some months might put through one batch during February or early March, and in the case of cockerels market them at three or four months of age so that the pens can be spelled again before the main hatching season.

In cases where cockerels can be raised in batteries a somewhat longer rearing period may be undertaken, say from January to March or April, but these birds would require to be sold at about three months of age.

One of the main drawbacks to "autumn" hatching is the risk of chicken pox occurring during the early stages of rearing, and for this reason it is unwise to attempt rearing at this time of the year if in a locality where fowl pox is usually severe. In some districts this disease is prevalent only in a mild form, and in such areas the risk would be justified.

The difficulty of obtaining chickens also operates against extensive rearing. As egg production from hens shows a sharp decline in February due to the moulting season, few hatcheries have pullets sufficiently mature

A Group of Well-grown Rhode Island Red Cockerels.



White Leghorn Cockerels Ready for Market.

to breed from at that time of the year. Even if early-hatched pullets were used many would also go through a partial moult. Thus only a limited number of large hatcheries can undertake to supply any appreciable quantity of chickens between February and the end of March, and those who do cater for this trade usually sell only mixed sexes, as they have difficulty in placing both sexes separately.

Clean up Rearing Accommodation.

One of the most important considerations in raising healthy chickens, apart from suitable equipment and good management, is the thorough cleansing of the pens as soon as possible after the season's chickens are removed from them.

This work is often neglected owing to other pressing work in connection with the management of the growing stock, and the result is that the outside runs become overgrown with grass or weeds before they are cleaned. When this occurs the cleaning is seldom done and any disease germs or worm eggs are covered with the overgrowth.

The correct procedure is to clean out the inside of the pens thoroughly and to scrub the floors, lower portion of the walls and any movable parts, including troughs, etc.; and then spray with a strong disinfectant. The outside runs should be scraped to remove any accumulation of manure, and if any disease has been present during the season, the surface should be saturated with a solution of caustic soda, using 1 lb. to each 20 gallons of water; this solution is also suitable for treating the inside of the houses.

After treatment, the pens should be allowed to stand empty until the next season. On no account should odd birds be put in the pens, or be allowed to get into them by gates being left open.

In the case of small runs which have been in use for a few years it is advisable to remove two or three inches of soil and replace with clean soil after leaving the surface open to the weather for several months. This is more important where outbreaks of disease have been experienced during the season.

Culling Time.

FROM now onwards, heavy culling can usually be done among the second-year birds. The extent to which culling should be carried out will depend largely upon egg production, and whether any birds are showing signs of moulting.

The first indication that the hens are about to moult is a drying or shrivelling of the comb and upon handling it will be found that the pelvic bones are close together. Such birds should be picked out and checked over, and if not laying, should be marketed before they commence to moult.

It should be understood that quite a number of second-year hens will continue to lay for some time yet, and a few might lay well into the autumn. Such birds would pay

better to keep for another season than the worst of the first-year birds.

Culling First-year Birds.

Generally speaking, the majority of first-year hens should pay to carry over another flush-laying season, but there may be a small proportion which cease laying and show indications of moulting. Most birds which commence to moult before March are not worth holding, as they seldom come back into production any earlier than the later moulters. Beginners should not confuse feather-picking with moulting and any birds which remain fresh in the combs and are losing their feathers should be suspected of being feather-picked.

Culling Young Stock.

During the next month or so, the pullets should be checked over to ascertain if extensive culling is necessary, though if they have been well reared, no drastic culling should be required. However, pullets hatched about the end of September, if not reared under good conditions, may be stunted and unthrifty. Such birds will never develop into payable stock and should be disposed of at once. Birds showing some comb development should be kept, as this is an indication that they are not far off laying.

Among the early-hatched birds, if reared without set-back, there should be only a few odd birds which would not pay to keep for the first flush-laying season. These would be the coarse-headed type or a few slow-maturing birds which have not developed to the same extent as the rest.

Pullets hatched in June and July or before that time, especially of the light breeds, may be expected to go through a partial moult any time from next month onwards, but as these birds usually come back into production again after four or six weeks, they should not be culled if they are otherwise good average birds.

Management Influences Production.

At this time of the year the housing and general management of the birds play a big part in maintaining production. Any overcrowding in the houses or the use of houses which are badly ventilated, may cause a premature moult. If the perches are too close together, thus preventing a free circulation of air between the runs of birds, this will also have a detrimental effect upon production; the perches should not be less than twenty inches apart and at least that height from the floor.

Skilful feeding where wet mash and grain are fed has an important bearing upon egg production. During the hot weather the appetites of the birds should be studied and when necessary, the quantity of food reduced so that no feed is left between one meal and another.

In the case of dry mash and grain feeding, the main consideration is not to allow grain to be left from the afternoon feed; it is, of course, necessary to leave the hoppers open to allow the birds to consume as much mash as is required. The difference is that the dry mash is not sufficiently palatable to cause the birds to eat more than is required, but on excessively hot days, it might be advisable to close the hoppers for a few hours in the afternoon.

By giving attention to these details, much can be done to maintain production throughout the end of the summer and autumn.

Promising Cherry Selection Bred by Department of Agriculture.

CHERRIES with commercial potentialities have been raised in a breeding programme started seventeen years ago at Orange and at the New England Experiment Farm.

The first selections propagated from the original plantings are now coming into bearing. At least one of these showed very well this season, in comparison with the standard early variety, Early Lyons, which has shown extremely severe losses this year from splitting of the fruit. Under similar conditions, the new selection showed only a small percentage of fruit split, and the cracks were small.

The selection has good commercial characteristics—being a good sized, red-black cherry of firmer flesh and with a shorter stalk than Early Lyons.

Propagation for testing of the selection in the main cherry-growing districts is to be carried out in the near future.—F. T. BOWMAN, Special Fruit Officer (Research).

Bush Fire Danger.

Chief Secretary's Warning.

A STRONG warning of the danger of bush fires has been issued by the Chief Secretary, Mr. Baddeley.

In it Mr. Baddeley reiterates the conditions governing the lighting of fires in the open air, which are applicable until the end of next March. These are:

Camp fires, etc.—To be lit in a properly constructed fireplace with a space of ten feet cleared around such fireplace, or otherwise in the centre of a cleared space of 15 feet.

Rubbish fires, etc.—Unless lit in a properly constructed incinerator, the lighting of such fires is restricted to the period between 7 in the evening and 7 in the morning. In the latter case a space of 15 feet must be cleared around the site of the fire.

Charcoal burning, etc.—A space of 100 feet to be cleared around the site of the fire.

These conditions applied in coastal and mountain areas, stated the Chief Secretary.

In addition, no fire could be lit for the purpose of clearing land in any part of the eastern and central divisions of the State unless a permit was first obtained from the local council or some person authorised by the council in that behalf.

Any person failing to comply with the aforementioned conditions was liable to a penalty not exceeding £100 or imprisonment for any period not exceeding a year, or to both such penalty and imprisonment.

Hybrid Maize Seed.

Available for Distribution to Growers in 1948.

HYBRID maize seed will be available next season for commercial planting. Hybrids yield as much as 25 per cent. more than the best present-day varieties.

Announcing this service, the Hon. E. H. Graham, M.L.A., Minister for Agriculture, said that the Department's hybrid maize-breeding programme was unfortunately completely halted for six years by the war. Progress had since been made, however, at Glen Innes and Grafton Experiment Farms.

The aim at Glen Innes Farm was to produce seed of crosses which would produce commercial hybrids suitable for northern tablelands conditions. The Department was co-operating with a seed company which had been formed to grow hybrid seed for distribution to growers. Seed of crosses made at Glen Innes Farm had already been sown at Armidale, in addition to 80 acres of imported seed of the best-known American hybrids. All were early-maturing types likely to be suitable chiefly for northern tablelands conditions.

Coastal maize growers were being catered for by Grafton Experiment Farm maize-breeding programme. Several acres of crosses raised at Grafton Farm had been sown this season to produce hybrid seed for distribution to coastal growers in 1948.

To demonstrate to maize growers the value of hybrid maize, said the Minister, his Department had planned to sow this season, in almost every maize-growing region of the State, yield tests of hybrids raised at its Experiment Farms.

Marketing of Bananas.

Precautions Against Deterioration in Transit.

To preserve the carrying qualities of bananas and minimise the likelihood of the fruit arriving at market in a mixed ripe or boiled condition, it is necessary for growers to observe the followng points:—

1. All possible precautions should be taken to keep the fruit cool, especially in very hot weather.

2. Fruit should on no account be left in the sun without a suitable cover. A well-ventilated shelter is necessary in which to keep bananas until picked up by the carrier.

3. The time between cutting and the departure of the train or boat should be reduced to an absolute minimum.

4. On no account should fruit showing the first signs of ripening be packed with green fruit. All ripening fruit should be rejected.

5. Bananas should be protected from the weather during transit from the plantation to the point of loading.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188
Hawkesbury Agricultural College, Richmond (Jerseys)	106
Hicks Bros., "Meryla," Culcairn	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)	49
New England University College, Armidale (Jerseys)	25
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	35
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco	76
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	37
Scott, A. W., "Milong," Young (Aberdeen-Angus)	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	169
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas, R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R., "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, T. L., and Sons, "Abington," Armidale	62
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
Salway, A. E., Cobargo (Stud Jerseys)	62
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys) ...	89	25/8/48
Berry Training Farm, Berry (A.I.S.) ...	128	13/11/48
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys) ...	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys) ...	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys) ...	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys) ...	33	23/6/48
Coote, B. N., Auburn Vale Road, Inverell (Jerseys) ...	113	14/8/49
Cowra Experiment Farm (Ayrshires) ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	3/3/48
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.) ...	49	17/12/48
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys) ...	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns) ...	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys) ...	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires) ...	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus) ...	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns) ...	68	7/1/48
Limond Bros., Morisset (Ayrshires) ...	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys) ...	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)..	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys) ...	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys) ...	51	11/4/48
New England University College, Armidale (Jerseys) ...	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys) ...	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns) ...	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys) ...	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus) ...	61	23/11/47
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus) ...	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook	94	27/10/48
Riverina Welfare Farm, Yanco (Jerseys) ...	91	14/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112	30/10/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns) ...	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale ...	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus) ...	170	21/2/48
Wagga Experiment Farm (Jerseys) ...	58	3/3/48
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords) ...	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus) ...	160	2/6/49
Wollongbar Experiment Farm (Guernseys)...	119	20/4/48
Yanco Agricultural High School, Yanco ...	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns) ...	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake ...	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle ...	49	14/4/48
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown ...	49	14/12/47
Brookfield Afforestation Camp, Mannus ...	209	14/4/48
Cameron, N., Montrose, Armidale (late New England Girls School) ...	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell ...	32	11/8/48
Coventry Home, Armidale ...	11	29/9/48
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home ...	29	25/2/49
Ebsman Bros., Inverell ...	39	29/8/48
Emu Plains Prison Farm ...	122	21/3/48
Fairbridge Farm School, Molong ...	25	9/7/47
Forster, T.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	111	9/9/48
Genge G. L., Euston, Armidale ...	36	22/9/48
Goulburn Reformatory, Goulburn ...	8	11/6/48
Grant, W. S., "Monkittee," Braidwood ...	22	20/5/48
Hannaford, A., Braidwood ...	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell ...	60	30/6/47
Hopkins, E. G., Wattle Farm Guest House, Bargo ...	4	27/6/48
Hunt, F. W., Spencers Gully ...	80	4/2/49
Ince, F., Hillgrove Road, Armidale ...	34	22/9/48
Johnson, A., "Rosedale," Grafton Road Armidale ...	26	22/9/48
Kenmore Mental Hospital ...	52	26/6/47
Koyong School, Moss Vale ...	2	5/3/47
Lawrence, S. A., Hillgrove Rd., Armidale ...	20	17/11/48
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lucas, L., "Braeside," Armidale ...	45	22/7/49
Lunacy Department, Callan Park Mental Hospital ...	43	4/4/47
Lunacy Department, Gladesville Mental Hospital ...	20	15/4/46
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital ...	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital ...	40	20/11/48
McMillan, N., Duval Road, Armidale ...	30	29/9/48
MacNamara, B., "Mount View," Cessnock...	58	16/5/48
Marist Bros. College, Campbelltown ...	7[illegible]	3/1/48
Mason, A., Killarney, Armidale ...	33	30/9/48
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell ...	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
O'Brien, O., "Mount View," Inverell ...	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	24	2/9/47
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
St. Ignatius' College, Riverview ...	27	14/8/48
St. John's Hostel, Armidale ...	6	24/6/49
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie ...	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	43	5/6/48
St. Patrick's Orphanage, Armidale ...	12	29/5/48
St. Vincent's Boy's Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay ...	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	53	10/2/48
Tanner, F. S., Dural Rd., Armidale...	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale ...	33	30/9/48
Tombs, P. C., Kellys Plains, Armidale ...	49	29/9/48
Tombs, R., Harlwood, Armidale ...	40	22/9/48
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook ...	97	24/4/49
Ursuline Convent, Armidale ...	5	7/10/48
Wallaga Lake Aboriginal Station ...	19	29/4/47
Waters, A., Marsh Street, Armidale ...	2	13/10/48
Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.	Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*			Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47	William Thompson, Masonic School, Baulkham Hills	52	10/6/48
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47	Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division Animal of Industry.

Anthrax—Important Points for Stockowners.

ANTHRAX is a serious disease of both animals and man. Actually, the distribution of this disease is generally limited in this State to certain well-defined areas, and these include belts of country through portion of the Coonamble, Canonba and Condobolin districts which are known as anthrax areas. There is also an area in the Molong district where the disease has appeared from time to time. It is most apparent during the summer and autumn.

In the areas mentioned, sudden deaths amongst any stock, with rapid swelling of the carcase and appearance of blood-stained fluid from the nostrils, etc., should put a stockowner on his guard. Sheep are usually found dead. Cattle which are seen every day may be noticed sick for twenty-four hours, fevered and off their feed. Milk flow is reduced, and abortion may occur. Horses may linger several days; they are sometimes affected with acute colic and swellings along the chest and belly. Dogs and pigs frequently show swelling of the throat with high fever.

In view of the serious nature of the disease, the stockowner should immediately notify his nearest Inspector of Stock in order that a diagnosis may be made. On no account should he attempt to carry out a post-mortem examination—for two good reasons: Firstly, because he may infect himself, and secondly because opening the carcase liberates thousands of organisms which form spores. These are very resistant and many remain in the soil for long periods—at least twenty years—and there is a danger to stock which may pick them up. That is the main reason why outbreaks continue to occur in the same areas.

Every animal which dies of anthrax should be thoroughly burnt once the diagnosis has been confirmed; and it should be burnt on the spot where it died in order to reduce the risk of spread of the organisms.

When an outbreak has been confirmed, then inoculation of all remaining healthy stock can be carried out by licensed inoculators. This will confer an immunity from it for eight to twelve months. It would then be necessary to inoculate all stock which run on the affected area every year in order to prevent further outbreaks.

Sometimes, of course, outbreaks will occur in new areas, but in most cases these are traceable to outbreaks on other properties where mortalities due to anthrax have been confirmed.

In man, infection is usually picked up as the result of handling carcases of animals which have died of the disease. The organism gains entry to the body through cuts and sores, the first symptom being the appearance of a rather typical sore, which is at first itchy, then becomes black in the centre. Early medical advice should be sought by anyone who has been handling anthrax cases and who finds such sores developing or becomes otherwise ill.—J. N. HENRY, Acting District Veterinary Officer.

Editorial—

Men and Materials.

UNTIL the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) launched his drive for increased food production per medium of Regional Conferences, many and varied reasons were advanced for lack of progress in our primary industries.

Those Conferences—several have been held in coastal areas and others are to follow at Bathurst and Wagga this month—have developed into what are virtually farmer forums, and have been eminently successful in diagnosing with certainty the ills which beset primary industries.

The unanimous acceptance now by the nation that shortages of labour and materials needed on farms are the real obstacles to increased production of foodstuffs for which the world, and particularly Britain, is clamouring, evidences the worth of the lead given by the New South Wales Minister for Agriculture. That diagnosis is a direct outcome of the Minister's regional food production drive conferences.

The Minister has made a further move. What can be done to cure those ills will be discussed at the Australian Agricultural Council's meeting on 9th and 10th February. Members of the British Food Delegation now in Australia have been invited to attend that meeting, and as the success of their mission largely depends on the discovery of a remedy, the outlook promises well.

It might be opportune again to remind primary producers of the questionable haste with which they sued for the throwing overboard of all controls immediately the war ended. Politically and individually controls are never popular, but in times of emergency they are essential.

They were essential in wartime, when it was demonstrated that men and materials were the only "commodities" necessary to wage a victorious war. Money was incidental, and when not directed along the right channels, it proved a definite hindrance. Our wartime economy had to be regimented so that the individual could not compete with the Government for the men and materials so essential to successful prosecution of the war.

Men and materials are again proving the only really essential "commodities" needed by the nation to help fight off world starvation. The present shortages of farm labour, machinery, spare parts, fencing wire, wire

netting, galvanised iron, etc., may be due to too little regimentation of our economy in the difficult period of transition from war to peace.

As is usual following a war, the spending power of the public has enormously increased and in the absence of adequate controls, that surplus spending power creates and encourages many unessential and high-profit earning "luxury" industries which can compete successfully with the farmer for his labour and with the machinery manufacturer and other industries supplying farm requirements for both their labour and materials.

If the unessential industries are obtaining their raw materials (and there is plenty of evidence that they are obtaining those materials in quantity) at the expense of the essential industries, then the question arises as to whether some direction of their output is necessary in the nation's interest. This much is certain, that if materials are directed into the right channels, labour will automatically follow the materials.

High Prices for Border Leicester Rams.

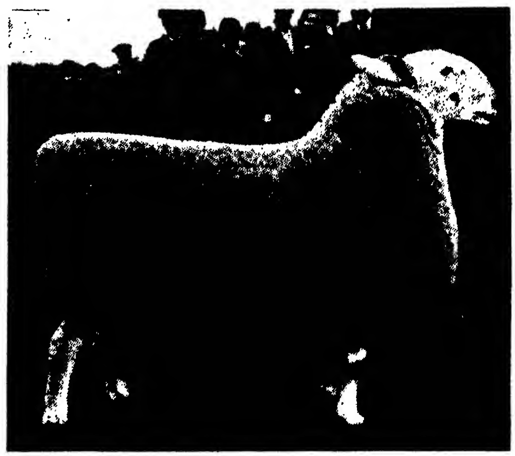
Progeny of Imported "De Luxe."

YOUNG rams sired by the Border Leicester ram "De Luxe," purchased by the New South Wales Stud Stock Buying Delegation for the Department of Agriculture, sold recently in Scotland for prices ranging up to £500.

Mr. Robert Forrest, of Preston Downs, Scotland, from whom the Delegation purchased the rams, recently sold six sons of "De Luxe" for an average price of £268 6s. 8d. Individual prices were £250, £500, £200, £270, £200 and £130. The young ram which brought £270 was a full brother of "Preston Explorer," a young Border Leicester ram purchased by the Delegation from Mr. Forrest for the Department of Agriculture.

The imported ram, "De Luxe" will be stationed at Wagga Experiment Farm for the coming season and selected ewes from registered breeders are being accepted for service.

"Preston Explorer" will be stationed at Trangie Experiment Farm again this season for service of selected ewes from registered breeders. During last season he sired 37 lambs from 36 ewes.



Son of De Luxe, Sold by Mr. Forest at Kelso in September 1947 for £500.

Tartar Emetic—Poison Risk Negligible.

SOME fears might arise regarding the use of tartar emetic as a fruit-fly poison, said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) referring to a recent misuse of this material. There is no evidence, said Mr. Graham, of any ill effects following the proper use of tartar emetic on fruit trees or tomatoes. The Departmental recommendation was to avoid spraying the fruit as far as possible. The small amount which adhered to the fruit in the process had never been found to affect persons eating the fruit.

Mr. Graham pointed out that Departmental pamphlets on the subject emphasised the necessity for keeping mixtures of tartar emetic in a safe place and properly labelled. If mixtures of sugar and tartar emetic, or of sugar, tartar emetic and water, were kept where they might be mistaken, and used for cooking or similar purposes, trouble was obviously likely to arise. But the same applied to any pest destroyer, in fact to poison of any kind whatsoever. Mr. Graham also pointed out that tartar emetic should not be mixed with sugar, but should be dissolved in water and the sugar added subsequently.

If tartar emetic was used in accordance with the instructions and the material was labelled and kept in a safe place no trouble whatever should arise.

The Germination of Sprung and Shot Seed Wheat.

AMY MYERS, Seeds Officer.

MORE than ordinary discrimination will be called for in the choice of seed wheat for the coming season, as much of the grain from the current harvest has been weather-damaged, causing a wide variation in its condition.

Germination tests of "sprung" and "shot" seeds taken from wheat samples drawn last month from three areas of this State have given the following results:—

Germination per cent. in 7 days of:—	*Sprung Wheat*			*Shot Wheat*		
	(a)	(b)	(c)	(a)	(b)	(c)
From South	80	84	82	81	85	65
From West	82	84	81	82	85	42
From North-west ...	80	88	81	63	65	56

(*a*) Untreated seed; (*b*) ceresan dusted; (*c*) copper carbonate dusted.

It will be seen that sprung seed untreated gave an average germination of 81 per cent., whilst untreated shot seed gave an average germination of only 76 per cent.

Treatment with Ceresan slightly improved germination with both classes of seed—to 85 and 78 per cent., respectively.

Treatment with copper carbonate did not affect germination of the sprung seed (average 81 per cent.), but reduced germination of the shot seed to 54 per cent.

The type of seed selected for these tests as sprung is illustrated in Fig. 2. The embryo has swollen with the absorption of moisture and has split the "skin" covering it; growth has ceased at this stage and the embryo has not emerged.

In the shot seed, illustrated in Fig. 3, growth has continued, and the embryo has emerged; the embryonic root and leaf can be seen.

These two types merge one into the other, and it is hard to say where "springing" ends and "shooting" begins; however, the results quoted are based only on the types of seed illustrated.

During handling the seed may receive further damage, and the embryo itself be dislodged. Such seeds are shown in Fig. 4. They are valueless since there is nothing from which a new plant can be produced.

Undamaged seed, of which 100 per cent. germination is expected, is illustrated in Fig. 1.

Bright, plump samples of grain should, of course, be used for seed if procurable, and bleached grain can be sown with confidence.

However, the germination tests shown above indicate the results likely to follow when, because it is not possible to obtain better seed, sprung and shot wheat must be used.

The results with seed that has been treated with copper carbonate and mercurial dusts indicate the influence of these treatments on the germination capacity of this weather-damaged seed.

A Simple Germination Test on the Farm.

The farmer who is doubtful of the germinating capacity of his seed wheat should make a simple germination test. While such a test will give some indication of germination in the field, it will *not* provide a

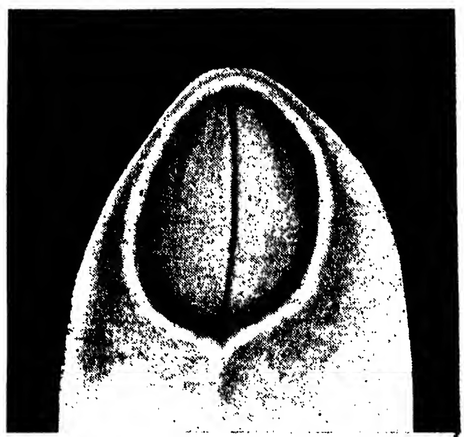


Fig. 1.—Diagram of Embryo End of Normal Wheat Grain.

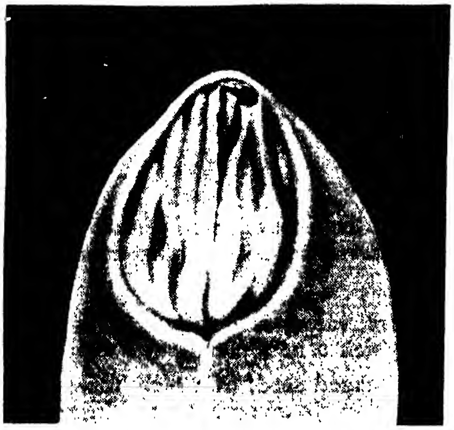


Fig. 2.—Diagram of "Sprung" Wheat Seed.

standard that field results can be expected to reach.

Method of Testing.

1. Take a sample from the top, middle and bottom of one or more bags.

2. Mix the sample thoroughly.

3. Count 100 seeds from this sample, rejecting only halves (or less than halves) of seeds. Any seed larger than half and damaged in any way whatever, therefore, will be included in the 100 seeds for testing.

Fig. 3.—Diagram of "Shot" Wheat Seed.

4. Take a piece of absorbent material such as cotton wool or towelling, etc., not less than four inches square. Put it on a dish and moisten it.

5. Spread the 100 seeds over the moistened material and put the dish in a cool place where the temperature would be about 70 to 75 degrees Fahr. It does not matter whether the dish is in light or darkness.

6. Keep the material moist for at least three days, then count the germinating seeds by lifting them from the material. If any seeds are left that seem capable of germinating, the test may be continued for another four days. This will give the percentage of germinable seeds in the sample.

It is most important that only seeds that produce normally developed seedlings be counted as germinated.

Standards for Defining Normal Seed.

A normal seed should produce three roots. The first emerges from the centre of the end of the seed where the embryo lies, and usually grows to about ¼ inch in length before the second roots appear, one on each side of this central root (see Fig. 5). Sometimes only two roots are developed, but if these are vigorous and strong, they may be counted as normal growths.

Fig. 4.—Damaged Wheat Grains from which the Embryo Has Been Dislodged.

The shoot usually develops at about the same time as the two "side" roots, and should grow upright from the seed. Occasionally it will grow along the surface of the seed, covered by a thin "skin" and

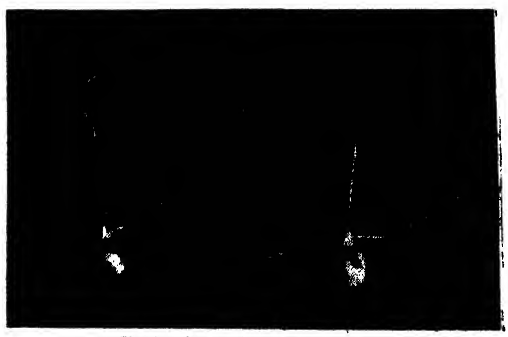


Fig. 5.—Normal Wheat Seedlings.

emerge at the end of the seed away from the embryo.

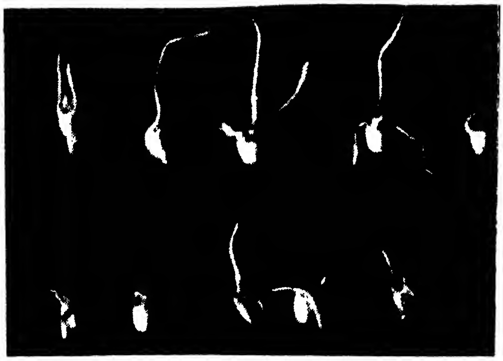


Fig. 6.—Abnormal Wheat Seedlings.

Damaged seeds may produce seedlings that would not grow into normal plants (see Fig. 6) and these, therefore, cannot be included in the germination percentage.

Such seedlings may develop abnormally in the following ways:

1. Only one root may emerge.
2. Three roots may emerge but no shoot develop.
3. The tip of the shoot may be damaged so that further growth cannot occur.
4. The shoot may be normal but no roots appear.
5. Mould growth may prevent development of any part of the seedling, or may prevent the seedling from emerging.

Winners of the Progressive Farmer Competition.

WINNERS of the Rural Bank's Progressive Farmer Competition, recently announced by the Hon. the Minister for Lands, Mr. W. F. Sheahan, M.L.A., are Messrs. W. A. Meares, of Forbes (mixed farmer); M. R. Buttsworth, of Hannam Vale (dairy farmer); and W. H. Bruce, of Baulkham Hills (specialist).

These three experienced New South Wales farmers will shortly leave for a world tour sponsored by the Rural Bank. Each member will have opportunities abroad to study the methods employed in world-renowned centres of advanced rural industry, and examine post-war progress of trials and research in staple and newly-introduced crops. They will also study scientifically-controlled experiments in animal husbandry throughout the United States of America, Canada and the United Kingdom.

Mr. Noel Griffiths, Public Relations Officer of the Bank, will be manager of the team, and Mr. C. P. Dowsett, Assistant Economist of the Bank, will accompany the team as economic adviser. An intense "on-the-spot" study will be made of all aspects of marketing, particularly in relation to present-day handling of primary produce in overseas centres of trade, and the trend of world markets.

Hon. W. F. Sheahan, M.L.A., Congratulates the Winners.
Standing in the background is Mr. C. R. McKerihan, President of the Rural Bank.

There were 105 entrants in the competition from all parts of the State except west of the Darling.

SEED WHEAT AND OATS

For 1948 Sowing.

LIST OF GROWERS OF APPROVED SEED.

IT has been decided to publish again this year a list of growers of approved seed wheat and oats who have supplies available for sale. The crops of the growers listed have been inspected by officers of the Department and have reached a standard of purity and trueness to type up to the approved standard. Growers listed should notify the Department immediately their available seed of any variety is exhausted.

WHEAT.

Bencubbin—

D. T. Clark & Sons, "Blythville," Monument Flats, Ungarie.
R. W. McLaren, "Glenmore," Barmedman.
Leonard Bros., "Sommerfield," Birriwa.
C. Walker, "Killara," Gulgong.
C. Bunner, "Woodbine," Baradine.
E. O. Schlunke, Reefton.
A. C. Dawes, "Killarney," Balladoran.
H. Duncan, "Springburn," Gilgandra.
R. Gilmour & K. Gellert, Breelong, Gilgandra.
C. R. Johnson, "Buckinbar" Estate, Yeoval.
W. G. Law, "Thistledown," Gilgandra.
Neilson Bros., Bearbung, via Gilgandra.
M. Powell, "Myall," Narromine.
F. C. Ziebarth, "Rose Wood," Binya.
H. Southwell, R.M.B. 405, Boorowa.
Flannery Bros., "Kalangan," Galong.
Mrs. Joyce, "Parkview," R.M.B. 995, Young.
J. Keir, "Braeside," Bogolong.
K. Hamilton, Harden.
H. H. Heath, "Eugildry," Leadville.
A. J. Rodham, Uranquinty.
B. Hart, Junee Reefs.
Stevenson Bros., Glen Iris, Marrar.
Estate of Mr. Harper, Albury Road, Wagga.
Brabin Bros., Kurrajong, via Junee.
G. Howard, Kallara, Springdale.
E. S. Beck, The Gap Road, Wagga.

Bordan—

R. W. McLaren, "Glenmore," Barmedman.
Mrs. Murphy, Farm 2363, Griffith.
A. C. Dawes, "Killarney," Balladoran.
W. M. Ross & Cullen Bros., "Ardersier," Harden.
H. J. Moran, "Avondale," Bribbaree.
Mr. A. D. Malcolm, Farm 1441. Murrami.
A. J. De Britt, "Semake," Tubble.
Estate of Mr. Harper, Albury Road, Wagga.

Bungulla—

D. T. Clark & Sons, "Blythville," Monument Flats, Ungarie.
Stevenson Bros., Glen Iris, Marrar.
Estate of Mr. Harper, Albury Road, Wagga.

Celebration—

T. Gleeson, "Larola," Tambar Springs.
H. H. Heath, "Eugildry," Leadville.
C. A. Oliver, "Melfort," Coolah.

Celebration—continued.

W. Philipson, "Grange View," Maryvale.
A. G. Thompson, "Wahroonga," Yalgogrin North.
A. Simpson, Delungra.
H. L. Hartigan, Goonoo Goonoo Road, Tamworth.
G. Barton, Goonoo Goonoo Road, Tamworth.
G. Dunn, "Dunreath," Tamworth.
B. Walters, junior, Winton.
P. Pearson, Muroon, Bithramere.
D. Barwick, Loomberah, via Tamworth.
W. Lye, Loomberah, West Tamworth.
T. W. Upperton, Weston, Castlemountain, via Quirindi.
A. J. Rodham, Uranquinty.
White Bros., Braemont, Boggabri.
J. K. McLennan, Gara, Armidale.

Charter—

E. Cunninghame, Cooininie, Springridge.
A. Hutchison, "Mundah," Tooraweenah.
E. MacDonald, Strathbogie, Emmaville.
F. J. Simmons, "Merrybow," Mullaley.
A. Duncan, "Springburn," Gilgandra.
W. Philipson, "Grange View," Maryvale.
F. C. Ziebarth, "Rose Wood," Binya.
A. G. Thompson, "Wahroonga," Yalgogrin North.
M. Powell, "Myall," Narromine.
R. B. Staggs. "Linden," Gilgandra.
W. H. Webster, "Windsor," Gilgandra.
H. C. Wilson, "Broom Hills," Gilgandra.
A. Simpson, Delungra.
T. Parkman, Inverell.
J. Neuss, Inverell.
E. Death, Caragabal.
B. Walters, junior, Winton.
T. W. Upperton, Weston, Castlemountain, via Quirindi.
White Bros., Braemont, Boggabri.
S. Carberry, Cadarga, T.P.O., Kiandool.
L. J. Griffiths, Ballandene, Gunnedah.
J. W. Wall, Stoney Creek, Narrabri.
C. J. Knight, "Buddahs," Narrabri.
H. A. Perrott, Dalmeny, Armidale.
R. Weiss, Mann-street, Armidale.
R. Coventry, Eathorpe, Armidale.
L. Hewitt, Springfarm, Armidale.
T. J. Edwards, Malvern, Armidale.
J. W. K. Mitchell, Carlowrie, Armidale.

Dundee—
B. Hart, Junee Reefs.
Brabin Bros., Kurrajong, via Junee.
Estate of Mr. Harper, Albury Road, Wagga.
C. S. Beck, The Gap Road, Wagga.

Eureka 2—
J. B. Barling, "Kia-ora," Gilgandra.

Fedweb—
J. Squires, Springridge.
Tribella Pastoral Co., Quirindi.

Ford—
J. Squires, Springridge.
L. Burden, Springridge.
R. W. McLaren, "Glenmore," Barmedman.
E. MacDonald, "Strathbogie," Emmaville.
Leonard Bros., "Sommerfield," Birriwa.
E. O. Schlunke, Reefton.
C. R. Johnson, "Buckinbar" Estate, Yeoval.
Wright & Southwell, "Hughstonia," Boorowa.
W. J. McCaffery, "Lindview," Grenfell-road, Young.
Mrs. Joyce, "Parkview," R.M.B. 995, Young.
J. Keir, "Braeside," Bogolong.
Lincoln's Pty. Ltd., "Clifton," Pte. Mailbag, Young.
W. F. & M. P. Crockett, R.M.B. 101, Dripstone.
C. File, Inverell.
White Bros., Braymont, Boggabri.
L. J. Griffiths, Ballandene, Gunnedah.
B. Hart, Junee Reefs.
Stevenson Bros., Glen Iris, Marrar.
G. Howard, Kallara, Springdale.
C. S. Beck, The Gap Road, Wagga.
Hall Bros., "Ellerslee," Wallendbeen.
Mrs. B. Wiggins, Back Creek Road, Young.

Gabo—
F. Cunnighame, Cooininie, Springridge.
A. Hutchison, "Mundah," Tooraweenah.
T. Gleeson, "Larola," Tambar Springs.
F. J. Simmons, "Merrybow," Mullaley.
C. W. J. Smith, "Norbiton," Canadian Lead.
H. H. Heath, "Eugildry," Leadville.
D. A. Cavanagh, "Yaralla," Ulamambri.
J. Renshaw, "Boogadah," Binnaway.
F. W. M. Colbran, Rawsonville, via Dubbo.
C. R. Johnson, "Buckinbar" Estate, Yeoval.
E. J. Morley, "Highfield," Maryvale.
W. Philipson, "Grange View," Maryvale.
R. Warren, Dickygundi, Dubbo.
F. C. Ziebarth, "Rose Wood," Binya.
L. N. Penfold, "Glenwood," Quandialla.
A. D. Dunkley, "Bonnie Lea," R.M.B. 909 Grenfell.
M. C. Roberts, "Hillside," Cootamundra.
H. I. McKenzie, Mooki Springs, Quirindi.
W. F. & M. P. Crockett, R.M.B. 101, Dripstone.
C. File, Inverell.
A. Nicholson, Inverell.
M. Wade, Delungra.
A. Simpson, Delungra.
J. Parkman, Inverell.
J. Neuss, Inverell.
Mrs. A. H. Nixon, "Oakhampton," Upper Manilla.
S. Carberry, Cardarga, T.P.O., Kiandool.

Gabo—continued.
White Bros., Braymont, Boggabri.
L. J. Griffiths, Ballandene, Gunnedah.
T. W. Upperton, Weston, Castle Mountain, via Quirindi.
A. J. Rodham, Uranquinty.
Stevenson Bros., Glen Iris, Marrar.
Brabin Bros., Kurrajong, via Junee.
C. S. Beck, The Gap Road, Wagga.
A. D. Malcolm, Farm 1441, Murrami.
Hall Bros., "Ellerslee," Wallendbeen.
L. Cunich, "Avoca," Young.
L. Ricketts, Peak View, Young.
J. N. Barrett, "Yera," Edgeroi.
J. W. Wall, Stoney Creek, Narrabri.
W. T. McCutcheon, "Ciamaltha," Narrabri.
Mr. A. H. Campbell, Beulah, Gunnedah.
C. Hathway, "Woodley," Curlewis.
E. Fletcher, Bellata.
Hann Bros., Courallie Park, Bellata.
S. Leitch, Springvale, Narrabri.
C. J. Knight, "Buddahs," Narrabri.
N. Donaldson, Braemar, Boggabri.
J. R. Simpson, Lignum, Curlewis.
H. G. Barwick, Willow Tree.
Stangar Bros., Curlewis.

Gular—
J. B. Barling, "Kia-ora," Gilgandra.
W. G. Law, "Thistledown," Gilgandra.
E. J. Morley, "Highfield," Maryvale.
M. Powell, "Myall," Narromine.

Javelin—
R. W. McLaren, "Glenmore," Barmedman.
F. C. Ziebarth, "Rose Wood," Binya.
R. T. Carr, "Enfield," West Wyalong.

Kendee—
Leonard Bros., "Sommerfield," Birriwa.
W. Philipson, "Grange View," Maryvale.
H. C. Wilson, "Broom Hills," Gilgandra.
A. G. Thompson, "Wahroonga," Yalgogrin North.
C. File, Inverell.
A. Nicholson, Inverell.
L. McGufficke, Inverell.
S. Carberry, Cadarga, T.P.O., Kiandool.
White Bros., Braymont, Boggabri.
L. J. Griffiths, Ballandene, Gunnedah.
T. W. Upperton, Weston, Castle Mountain, via Quirindi.
Estate of Mr. Harper, Albury Road, Wagga.
G. Howard, Kallara, Springdale.
C. S. Beck, The Gap Road, Wagga.
A. D. Malcolm, Farm 1441, Murrami.
G. Jones, Farm 1134, Murrami.
J. W. Wall, Stoney Creek, Narrabri.
C. Hathway, "Woodley," Curlewis.

Koala—
E. O. Schlunke, Reefton.
C. R. Johnson, "Buckinbar" Est., Yeoval.
O. Molkentin, "Clear View," Gilgandra.
H. C. Wilson, "Broom Hills," Gilgandra.
A. J. Rodham, Uranquinty.
Hall Bros., "Ellerslee," Wallendbeen.
G. Howard, Kallara, Springdale.

Koorda—
R. W. McLaren, "Glenmore," Barmedman.

Nabawa—
D. T. Clark & Sons, "Blythville," Monument Flats, Ungarie.

Rapier—
M. Powell, "Myall," Narromine.

Scimitar—
R. W. McLaren, "Glenmore," Barmedman.
F. C. Ziebarth, "Rose Wood," Binya.

Waratah—
H. Southwell, R.M.B. 405, Boorowa.
Mrs. B. Wiggins, Back Creek Road, Young.

Yalta—
F. Cunninghame, Coonimie, Springridge.
E. MacDonald, Strathbogie, Emmaville.
T. Gleeson, "Larola," Tambar Springs.
F. J. Simmons, "Merrybow," Mullaley.
H. H. Heath, "Eugildry," Leadville.
D. A. Cavanagh, "Yaralla," Ulamambri.
J. Renshaw, "Boogadah," Binnaway.
W. Philipson, "Grange View," Maryvale.
W. H. Webster, "Windsor," Gilgandra.
A. G. Thompson, "Wahroonga," Yalgogrin North.
C. File, Inverell.
G. Barton, Goonoo Goonoo Road, Tamworth.
B. Walters, junior, Winton.
P. Pearson, Murroon, Bithramere.
W. L. P. Richardson, "Bereen," Barraba.
D. Barwick, Loomberah, via Tamworth.
L. R. Owens and G. Phillips, "Ora," Currabubula.
Mrs. A. H. Nixon, "Oakhampton," Upper Manilla.
W. Lye, Loomberah, West Tamworth.
S. Carberry, Cadarga, T.P.O., Kiandool.
White Bros., Braymont, Boggabri.
T. W. Upperton, Weston, Castle Mountain, via Quirindi.
B. Hart, Junee Reefs.
Brabin Bros., Kurrajong, via Junee.
L. J. Griffiths, Ballandene, Gunnedah.
J. N. Barrett, "Yera," Edgeroi.
J. W. Wall, Stoney Creek, Narrabri.
C. Hathway, "Woodley," Curlewis.
E. Fletcher, Bellata.
C. J. Knight, "Buddahs," Narrabri.
J. D. Cameron, Pretoria, Culgoora.
H. G. Barwick, Willow Tree.
H. E. Fife, Culgoora.

OATS.

Algerian—
R. W. McLaren, "Glenmore," Barmedman.
A. S. Dickson, "Yurunga," Oberon.
J. C. Blackmore, Mt. View, Clandulla.
J. V. Carter, "Brynog," Ulamambri.
H. V. Hughston, Boorowa.
F. Downes, "Trenayr," Boorowa.
J. D. McClintock, "Dinyah," Cootamundra.
D. Adamson, Mendarie, Dirnaseer.
S. Todd, Mannus, Tumbarumba.

Algerian—continued.
S. A. Cooper, Waroo, Eurongilly.
C. O. Jenkins, Kyalla, Burrandarra.
A. J. McRae, Lucerne Vale, Mangoplah.
Higman Bros., Rannock, via Coolamon.
W. C. McCosker, Inverell.

Belar—
R. W. McLaren, "Glenmore," Barmedman.
G. Dougan, "Fairfield," Mirrool.
J. C. Blackmore, Mt. View, Clandulla.
J. Wansey, "Abington," Tambar Springs.
K. Maxwell, "Sansgrove," Studdo Creek, Gulgong.
H. E. Ward, Parkes.
Lindsay & Harriett, Parkes.
H. C. Wilson, "Bungey," Gilgandra.
M. Sharman, Box 1, P.O., Rankin Springs.
M. C. Roberts, "Hillside," Cootamundra.
J. D. McClintock, "Dinyah," Cootamundra.
A. M. Campbell, "Billabula," Young.
J. W. Robinson, Tallandoon Park, West Wyalong.
D. Adamson, Mendarie, Dirnaseer.
S. Todd, Mannus, Tumbarumba.
S. A. Cooper, Waroo, Eurongilly.
C. O. Jenkins, Kyalla, Burrandarra.
A. J. McRae, Lucerne Vale, Mangoplah.
Higman Bros., Rannock, via Coolamon.
W. C. McCosker, Inverell.
S. Thomas, Delungra.
Rohde Bros., Pallamallawa.

Buddah—
K. Maxwell, "Sansgrove," Studdo Creek, Gulgong.

Fulghum—
R. W. McLaren, "Glenmore," Barmedman.
R. M. Hore, "Redcliffe," Grenfell.
D. Adamson, Mendarie, Dirnaseer.
S. Todd, Mannus, Tumbarumba.
S. A. Cooper, Waroo, Eurongilly.
C. O. Jenkins, Kyalla, Burrandarra.
A. J. McRae, Lucerne Vale, Mangoplah.
Higman Bros., Rannock, via Coolamon.
W. C. McCosker, Inverell.
S. Thomas, Delungra.
Rohde Bros., Pallamallawa.

Gidgee—
G. Dougan, "Fairfield," Mirrool.

Lampton—
J. Wansey, "Abington," Tambar Springs.
S. Todd, Mannus, Tumbarumba.
S. A. Cooper, Waroo, Eurongilly.
C. O. Jenkins, Kyalla, Burrandarra.
A. J. McRae, Lucerne Vale, Mangoplah.
Higman Bros., Rannock, via Coolamon.
W. C. McCosker, Inverell.
S. Thomas, Delungra.
Rohde Bros., Pallamallawa.

Mulga—
D. Adamson, Mendarie, Dirnaseer.
W. C. McCosker, Inverell.
S. Thomas, Delungra.
Rohde Bros., Pallamallawa.

Wongan—
H. C. Wilson, "Bungey," Gilgandra.

GROWING GREEN PEAS.

A. C. ORMAN, H.D.A., Special Agronomist.

PEAS are the most popular green vegetable grown in New South Wales. Although the pea crop requires for its best development a temperate climate, the range of conditions in this State is such that the crop can be harvested in one part or another during every month of the year.

In the cooler portions of the State the harvesting season is during the summer months—a period when the growth of the crop is limited in other districts owing to the heat. During autumn and spring, when frosts are sufficiently severe to cause damage to peas in cool, elevated districts, conditions are then suitable for the crop in warmer coastal and inland districts, while in the frost-free regions bordering on the sea the peas are grown for harvesting throughout the winter months.

Whilst the plant itself is seldom injured by frost, the flowers and pods are not so hardy. Young pods that have been frosted and that are unlikely to develop may be distinguished by a characteristic white, mottled appearance on the outside skin. Experience of local conditions and, to a certain extent, luck in missing damaging frosts at flowering regulate the range in planting dates from the early to the late sown crop. Damage from frost may be only partial, and a later crop of bloom on plants previously "nipped" may form without further trouble in this respect and provide satisfactory yield.

Seed Crops When Market is Glutted.

During periods of glut many consignments realise less than the picking and forwarding costs, and are then a direct loss to the growers. Under these circumstances, provided the stock was free from disease, it would be advisable for growers to consider maturing the crop for seed. If this were done a good deal of expense of future crops would be saved, and, apart from supplying his own requirements, the grower should have little difficulty in disposing of further supplies, should the quality be satisfactory.

Whilst the growing of seed for the market demands that care should be exercised in eliminating strangers, etc., it has been proved that seed grown in this State is equally as good as that produced in other States or overseas. As the supply of pea seed is now very largely imported, it is in the interests of the State and producers generally that greater attention be given to this aspect of the pea-growing industry. The possibilities in this direction should certainly not be lost sight of during periods of glut, particularly in the tableland districts, where very large areas are at times under cultivation.

A Good Soil Improver.

A sandy loam is most suitable for peas, but almost any soil of fair average quality will provide good yields. As with all legumes, the supply of nitrogen in the soil is a matter of less moment than that of phosphoric acid, potash and lime, and hence it is that in some localities dressings of fertilisers that contain the last three have a material effect upon the yield.

The crop has the strong recommendation that, in addition to yielding profitably, it contributes to the fertility of the soil for other crops by increasing the store of nitrogen, and providing a considerable quantity of top-growth of a kind that rots down readily when turned under. Peas do well on newly-broken land, and can be used as a preparation crop.

Sowing and Cultivation.

The water requirements of a crop of peas are considerable, and preparation of the soil should be commenced early enough to enable a supply of moisture to be stored. The land should be cultivated as required to conserve all rain that falls, to destroy weeds and to produce a good tilth in which the roots will find favourable conditions. Every endeavour should be made to induce germination of weed seeds before the crop is sown. If this is done the subsequent cleaning of the crop will be much easier.

During the picking season there is often little time to attend to destroying weeds, hence the necessity for thorough cultivation during soil preparation and early stages of growth. A good strike of weed seeds can

usually be controlled by harrowing, which is so much quicker than inter-cultivation work, which would be necessary once the crop is sown.

For market production peas usually are sown in single rows spaced 21 to 30 inches apart, whilst for canning and quick freeze production double rows 4 to 7 inches apart with 21 to 28 inch centres are favoured. On the Murrumbidgee Irrigation Area it is usual to sow double rows with 28-inch centres and furrow irrigate between the sets of double rows. Distance between rows varies with the district, variety and soils. Wide spacing is adopted for tall varieties and rich soils.

Two-row seed drills are favoured by many growers. Machines of this type are available which place the fertiliser slightly to either side of the seed and below it. They are to be preferred to those machines in which there is no provision for placing the fertiliser away from the seed. Some growers use the ordinary grain drill, the desired distance between rows being obtained by sowing through some of the runs and blocking off or closing the rest.

For small areas it is a common practice to open up shallow drills, drop the seed by hand, and cover to a depth of about 2 inches by means of a harrow, light cultivator or hand hoe. When sown by hand in open drills, the rows are wider and greater support is given by one pea plant to another, and hence the crop stands up better than when sown by drill.

Coastal growers in areas of high rainfall usually adopt the practice of trellising the variety Greenfeast. The rows are planted 3 to 4 feet apart, 5-feet stakes being driven in 6 inches every 20 feet, and wires (a little thicker than tie wire) are run along the stakes either on alternate sides or in pairs (one on each side) at intervals of 6 to 8 inches. The wires are strained to stout short pegs at each end of the rows. The advantage of this system is that less disease results and the picking of the crop is facilitated.

About 1 bushel to 1 bushel 1 peck of seed is the usual rate of seeding per acre.

The seed should only be covered to a shallow depth, but in hot months it may be necessary to make sowing drills deeper in order that the seed be planted in a moist layer of earth. When this is done greater care will need to be exercised in covering. Seed so sown is then at a disadvantage should rain or thunderstorms occur, as water quickly lodged in the drill depressions, and more than likely results in a poor germination. Pea seed often fails to germinate when heavy rain falls after sowing; thus where irrigation is available the aim, once the seed is sown, should always be to obtain germination before applying water.

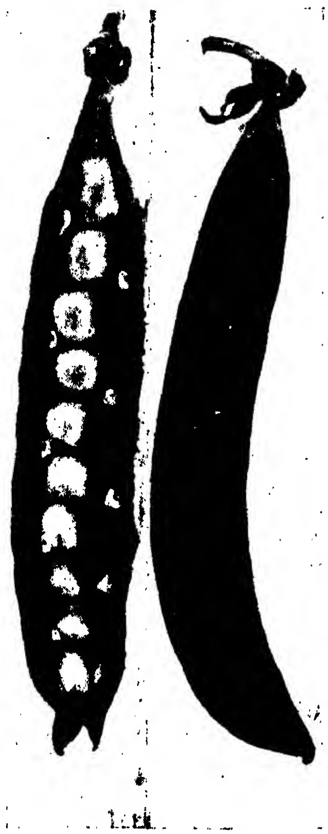
In coastal districts in frost-free situations sowings may be made from February to August. In other coastal areas and in inland districts, with the exception of the tablelands, sowing periods are May to August and in January. On the tablelands sowings are made from September to a time —usually December or early January— likely to catch the Easter market; sowings are made later, but risk of frost is great. The Christmas market can be catered for by sowing the first week in October. In some tableland districts in favoured localities it is possible to sow as early as July, but a knowledge of local conditions is necessary to determine the month when sowing can be commenced without undue risk.

Fertilisers.

In practically all districts of the State the application of superphosphate results in increased yields, and the usual application recommended is about 2 cwt. per acre. Heavier dressings than these have come under notice. As much as 5 cwt. per acre of a mixed fertiliser, containing approximately 5 per cent. nitrogen, 10 per cent. phosphoric acid and 5 per cent. potash, may be profitably employed. Such heavy applications, however, are only recommended for high rainfall areas or where irrigation is available.

On light, coastal sandy soils the addition of sulphate of ammonia to the superphosphate usually will result in increased yields. A mixture consisting of four parts of superphosphate and one part sulphate of ammonia has given good results in both the tableland and coastal districts. The usual rate of application is 2½ cwt. per acre in tableland districts, whilst in coastal districts the rate may be increased, especially on the light sandy soils.

Fertiliser should not come in contact with the seed, as poor germination is likely. Sowing machinery is now available that will



Greenfeast.

plant fertiliser in bands to one side of the seed line.

Yields.

Yields of from 60 to 80 bushels of green pods are fairly general, while even 100- to 200-bushel yields are not uncommon. Under particularly suitable conditions 4 tons of green peas (320 bushels) is not looked upon as extraordinary.

The average yield of seed in a good season is in the vicinity of 15 bushels per acre. Generally speaking, a yield of 10 bushels of green peas is equivalent to 1 bushel of dried peas.

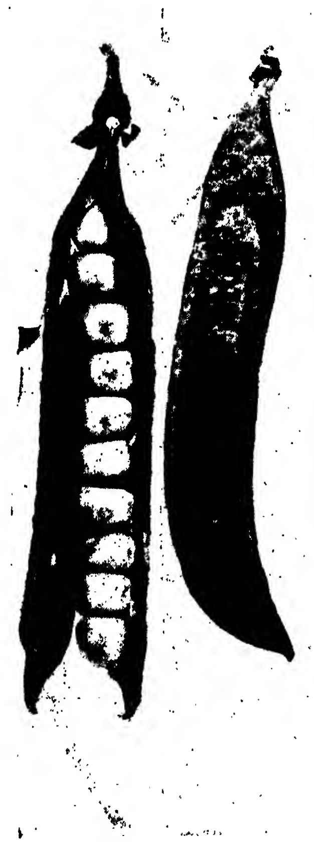
Harvesting and Marketing.

Pods should be picked as soon as the pea kernels are full and give the pod a tight feel, but before any loss of colour occurs such as is the case when on the turn to maturity. Twenty-eight pounds of green peas is the usual trade recognition of a bushel weight. Growers sending their peas long distances must always allow for loss by shrinkage in transit, and in some cases it is usual to reckon on a 2 lb. loss per bushel.

If the peas have to be stored on the farm for any time before despatch it is advisable that they be spread out on the floor of a shed or other cool place rather than left in bags. Sweating in heaps in the shed will not be as harmful as would be the case in bags, particularly full chaff bags. The usual method of marketing is in small bags—about 2 bushels in size—which are purchased by the grower or supplied by the agent who is to dispose of the crop.

For local markets it is often an advantage to do up in small lots of about 7 lb. in order to cater for family supplies.

Picking costs vary with the crop and market price. The present price is from 3s. to 4s. per bushel, but with high yields it may be possible to secure pickers at a lower price. When the yield is low the price



Richard Seddon.

increases proportionately, and under these conditions it is only possible for the grower to bear such an expense when market prices are high. Some growers pay 25 per cent. (or 3d. in the shilling) of the market realisation. Thus with a market price of 10s. per bushel the price paid to the picker would be 2s. 6d. per bushel. Under this system a minimum as well as a maximum price is usually paid.

A careful watch should be kept on the pickers to see that only the full pods are harvested. Prime quality peas should be of similar varietal characteristics, fresh, tender, firm and green, of similar maturity, but not over-ripe. They should be free from decay, disease, dirt, leaves and other foreign matter, and from damage caused by frost, splitting, hail, insects, mechanical or other means. The pods should be well filled, that is at least two-third filled with well or fairly well developed peas.

It is important that flat pods be eliminated from any consignments marketed.

Varieties.

For field areas cultivation is restricted to dwarf types, but in home gardens, where it is desirable to curtail the area, good use can be made of the tall growing sorts, which should be supported by small dry limbs of trees or on netting or trellis. One of the best varieties for this culture is Duke of Albany, often referred to by local seedsmen as Telephone.

The variety favoured for field culture is Greenfeast, and most commercial growers are now well acquainted with its merit. It is a large-podded variety, with a curved end, usually containing about nine peas; it is a favourite on the market. One of the advantages of this pea is that it retains its colouring during transit, whereas some of the varieties previously cultivated were inclined to become rather pale, which is a bad feature in the marketing.

Massey, which is known also as The Gem and Kelvedon Wonder, has become popular in both coastal and tableland districts, both for late and early planting. This variety, although not as heavy a cropper as Greenfeast, is quick maturing and produces excellent quality pods. Being early maturing, it is particularly valuable for planting as a spring crop on the coast and for later summer planting in the tableland districts.

Other varieties which find favour are Richard Seddon and Witham Wonder, both large-podded sorts. Richard Seddon is favoured by many growers in the County of Cumberland for growing for the autumn crop, as it is the general impression that they will pod better in cooler weather than most other varieties.

The old popular favourite, Yorkshire Hero, is yearly becoming less popular owing to the small size of its pods in comparison with other varieties previously mentioned. It is, however, a fairly hardy sort, can generally be relied upon to crop well and has a sweeter flavour than most commercial varieties.

Peas for Canning.

In recent years canned peas have become very popular with the public, and large quantities of peas are now canned annually. It has been customary for canners to operate during glut periods, but some canners are now entering into contracts with growers to supply their requirements. Up till recently, Greenfeast was the variety mainly used for canning, but Canners' Perfection and Witham Wonder also have been found suitable in some districts.

Diseases and Pests.

Pea crops in this State are affected by leaf and pod spot, bacterial blight, root rot, mosaic and other diseases, while damage from cutworms, red spider and weevils also occurs. The control of these diseases and pests is discussed in separate departmental pamphlets, obtainable free on application to the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

ROTATIONAL HORTICULTURE

Is Essential to Permanency in the Industry.

B. OWEN FRENCH, B.Sc.Agr., H.D.A., Assistant Fruit Officer (Research).

THE principles of crop rotation have not usually been considered as being applicable to fruit growing in Australia. However, an increasing awareness of reduced soil fertility in our orchard lands suggests that in its essentials, permanent horticultural production makes the same demands as any other form of cropping—and that the day of reckoning for past failure to recognise this fact, may have arrived.

That the principles involved in permanent agricultural production have been overlooked for so long by horticulturists is probably very largely due to the fact that the tree, as a crop, may involve the use of the land for a period of twenty years or more. As a result, changes in soil fertility tend to be taken as a matter of course, and their importance is only recognised when it becomes necessary to replant the land and start the next crop of trees.

The horticultural industry is a relatively youthful one in this State. For instance in 1900-01 the total area planted to citrus trees in New South Wales was only 14,965 acres, but by 1910-11 this had increased to 20,108 acres, and by 1930-31 to 33,464 acres. These and other relevant statistics are detailed in Table 1.

From these figures it is evident that a considerable proportion of the existing horticultural plantings of New South Wales were established some twenty or thirty years ago, and it is not surprising, therefore, that the problems of declining soil fertility have not received the attention they have in some other agricultural industries. To a large extent the land is only just completing its first cycle of crop production, and as a result the problems of replanting and reduced soil fertility are only making themselves felt for the first time.

The history of some of the older fruit-growing districts clearly indicates that they have suffered a severe decline in soil fertility, although from the point of view of overall State production this has been

masked by expansion in other areas. The general history of the older horticultural areas has been, first, a period of intensive planting and high productivity which, as fertility declined, has given way to a second period of less intensive horticulture and a trend towards other systems of land use, horticultural production moving on to exploit the virgin fertility of some new area.

TABLE 1.—AREA AND PRODUCTION OF CITRUS AND TREES OTHER THAN CITRUS IN NEW SOUTH WALES.*

Year.	Citrus.		Trees other than Citrus. Area.
	Area.	Production.	
	Acres.	Bus.	Acres.
1900-01	14,965	648,628	31,269
1910-11	20,108	1,478,306	27,246
1920-21	28,435	2,000,756	41,611
1930-31	33,464	2,935,728	39,639
1940-41	27,617	2,705,547	41,465
1946-47	29,917	3,013,452	38,349

* Source: Government Statistician of N.S.W.

The statistics of Tables 2 and 3 in reference to two old fruit-growing districts, the Baulkham Hills and Hornsby Shires, illustrate the decline in productivity which has occurred, and which is very largely the result of depleted soil fertility.

TABLE 2.—AREA UNDER FRUIT TREES, BAULKHAM HILLS SHIRE.*

Year.	Citrus Fruit.		All Other Fruit.	
	Productive Trees.	Young Trees Not Bearing.	Productive Trees.	Young Trees Not Bearing.
	Acres.	Acres.	Acres.	Acres.
1922-23 ...	2,955	579	1,015	129
1930-31 ...	3,521	501	599	117
1940-41 ...	2,596	389	533	161
1945-46 ...	2,596	460	588	101

* Source: Government Statistician of N.S.W.

TABLE 3.—AREA UNDER FRUIT TREES, HORNSBY SHIRE.*

Year.	Citrus Fruit.		All Other Fruit.	
	Productive Trees.	Young Trees Not Bearing.	Productive Trees.	Young Trees Not Bearing.
	Acres.	Acres.	Acres.	Acres.
1922-23 ...	2,908	500	941	102
1930-31 ...	2,914	440	528	108
1940-41 ...	1,901	277	452	99
1945-46 ...	1,920	354	490	94

* Source: Government Statistician of N.S.W.

Such a state of affairs cannot go on forever—sooner or later the horticultural industry must reach a stage where it will be faced with the necessity of re-using land previously planted to fruit trees. In fact, in many horticultural areas, the problem is one of immediate urgency if the capital invested in the farms is to be preserved.

The industry is faced, therefore, with the problem of developing a cultural system which will establish it on a basis of perpetual land use.

These problems are receiving particular attention on the Murrumbidgee Irrigation Areas of New South Wales, and in order to base the subsequent discussion of general principles on a practical problem, the problems of that district will receive close analysis.

Soil Degeneration under Irrigated Horticulture.

The problems of soil fertility maintenance make themselves felt very acutely under irrigation area conditions because the amount of land available is rigidly confined by the limits of supply channels, and therefore the necessity for re-using old land is more quickly apparent.

Furthermore, the intensive cultural practices associated with irrigation farming speed up the processes of soil degeneration and the natural fertility of the soil is quickly consumed. Consequently, after a little more than a quarter of a century of cultivation, Murrumbidgee Irrigation Area settlers are faced with a very real problem of reduced soil fertility. This loss of soil fertility—with which this article is concerned—is quite distinct from that which is caused by waterlogging or salt; it is due to the loss of soil organic matter and the breakdown of soil structure.

The decline in soil fertility is easily recognised by such signs as the reduced vigour of replanted trees and of orchard weed growth, but under irrigation one of the most important symptoms is an increasing difficulty in obtaining satisfactory depth of penetration of irrigation water. The ease with which water soaks into the soil is largely determined by its structure—or the way in which the individual soil particles are aggregated into crumbs, and the size of the crumbs. In the early days of settlement satisfactory penetration was readily obtained, but it is now general experience that on

the heavier soils, loams and clays it is difficult to get the water to soak down even as far as 12 inches.

The cultural systems previously adopted have been extremely severe on soil structure. High soil moisture and high temperature conditions have promoted the decomposition of soil organic matter, the presence of which is such an important factor in soil fertility. Clean cultivation was adopted to such an extent as to become a fetish, and the soil was subjected to a constant succession of cultivations, smoothings and furrowings, the mechanical force of which played a big part in the smashing of the soil crumbs.

Murrumbidgee Irrigation Area horticulturists are, therefore, faced with the necessity of changing their cultural systems in order to rebuild and maintain the productivity of the land. This could involve—(1) Adoption of a cultural system which would maintain the fertility of the soil at its virgin level during the life of the tree; (2) Adoption of a cultural system which, while involving a loss in soil fertility during the life of the tree, would make provision for rebuilding it in some subsequent period prior to the planting of the next crop of trees, i.e., rotational horticulture; (3) Adoption of a combination of (1) and (2), with the object of reducing the soil regeneration period.

Prevention of Soil Fertility Decline During the Life of the Tree.

The cultivation of leguminous winter green manure crops—tick beans (*Vicia faba*), field peas (*Pisum sativum*) and the naturally occurring Burr trefoil (*Medicago denticulata*)—is an accepted practice on the Murrumbidgee Irrigation Area. However, their cultivation is not as widespread as would seem desirable and in large measure this is due to the fact that they do not completely suit the local conditions. The possibilities of using other legumes should receive closer investigation.

Generally speaking it has been found that, except in the moisture years, winter growing legumes sown in March and April, do not grow satisfactorily. If a suitable crop is obtained it should be sown somewhat earlier in order to receive the benefits of a number of autumn irrigations. However, this practice conflicts with harvesting operations and also causes serious difficulties with irrigation, particularly on the lighter, sandier soils, as the plant growth impedes the flow of the irrigation water and in this way results in over-irrigation.

In any case, even if satisfactory crops of winter green manures could be obtained every year, it seems unlikely that they would be sufficient to stop soil deterioration, although they would act as a brake and slow up the process.

In view of these difficulties, attention is being given to the possibility of using controlled sod culture. Under this scheme, the orchard is laid down to some perennial, summer-growing legume, such as White clover or lucerne, and the summer growth is controlled by frequent mowing.

This system of management has much to recommend it, not only from the point of view of soil fertility maintenance, but also from the aspect of reduced cultural costs. However, experimentation with this system is, as yet, only in its infancy, and it is impossible to say at this stage whether the method could be adopted to all conditions and to what extent it would eliminate the necessity for adopting a soil building rotation.

Methods of weed control involving the grazing of poultry and the use of weedicides would undoubtedly result in fertility conservation and may ultimately find a place as a cultural system, but experience of them at the moment is practically nil.

The difficulty of preventing the decline of soil fertility on the Murrumbidgee Irrigation Area was recognised in a pamphlet* issued in 1941 by the Irrigation Research Extension Committee. The pamphlet states ". . . . experience suggests that our (Murrumbidgee Irrigation Area) horticultural soils, by and large, are not suitable for continuous orchard production under conditions of standard practice and that a period of soil regeneration is necessary between plantings."

". . . . a fairly long term of grazed pasture is desirable. The pasture should be wholly or partly leguminous . . . ."

* Advice on Horticultural Land Use in the Murrumbidgee Irrigation Area of New South Wales.

The pamphlet did not make any definite recommendations regarding the period for which the land should be laid down to pasture, and indeed it will be impossible to make any definite statement until the processes involved in soil degeneration and soil regeneration have received close study.

Murrumbidgee Irrigation Area horticulturists now appreciate that, if soil fertility is to be maintained indefinitely, the land must be given an opportunity to regenerate before replanting, and a system of rotational horticulture must be adopted. The recognition of this fact raises some very real problems in farm organisation and management.

(To be continued.)

The Drying of Figs.

A. H. SKEPPER, Fruit Officer.

WHITE varieties of figs are preferable for drying. In this State, the varieties Smyrna and White Adriatic are usually grown for this purpose. White Adriatic figs should be caprified. Choice fruit of good size, with a thin skin and high sugar content should be used to obtain a good quality product. It has been found that the best quality dried article is produced in districts where hot, dry summers are experienced.

Harvesting.

The fruit is harvested when it is thoroughly ripe and in a wilted condition. The figs may be picked from the tree, taking care that the stem is not separated from the fruit. Removal of the stem results in damage to the fruit, and the dried product has a ragged appearance. Alternatively, the fruit may be allowed to fall to the ground. This method is to be preferred, as fruit so harvested is less liable to fermentation or mould during drying. Furthermore, such fruit does not sweat so freely after drying and packing, and consequently the packets and labels remain more attractive, being less liable to staining.

Prior to harvesting, the ground under the trees should be cultivated to clear the weeds and thus make the job of collecting the fruit easier. A light shake of the branches will bring down fruit which is fully ripe and ready for drying. With White Adriatic figs the fruit sometimes does not fall readily, in which case the tree should be picked over. The figs should be picked up at frequent intervals and not allowed to remain on the ground for more than two or three days.

When gathered, the fruit is placed into perforated dipping buckets and immersed in a boiling brine made by dissolving 3 oz. of common salt to each gallon of boiling water. This removes dirt from the fruit and slightly cracks the skin and so assists the drying.

Sulphuring.

After dipping, place the fruit on wooden trays, with the "eye" uppermost. If a light-coloured dried article is desired, the fruit should be exposed to sulphur fumes for 20 minutes or longer, according to the condition of the fruit and atmospheric temperature. On cool days and with partly dried fruit, the longer sulphuring period is necessary. Sulphuring, in addition to improving the colour, helps to prevent the development of moulds. However, sulphuring is not usually done in this State, as unsulphured fruit is considered by many to have a superior flavour.

There are a number of designs for sulphur boxes, but one which has been found satisfactory consists of a movable box frame covered with an airtight material such as malthoid, and sufficiently large to hold twelve to fifteen trays of fruit with a clearance of 6 inches between the trays and the sides and tops of the box. Trays should be staggered 6 inches when stacking. One or two ¾-inch vent holes are made at the top of the box close to the ends. This ensures free movement of the sulphur fumes through the box. Should the ventilation be too great, some of the holes can be blocked up.

The sulphur is burned in a pit just outside one end of the box and having a free entrance to it. A small inlet vent into the pit is also needed. The sulphur should burn steadily during the time the fruit is in the box, and slight fumes should be apparent

issuing from the vent holes. Should the sulphur be all burned before the expiration of the sulphuring period, it is an indication that the draught is too great. About 4 to 5 lb. of sulphur should be ample for each ton of fruit.

Handling the Fruit on Trays.

When ready for drying, the trays of fruit are placed in the sun on a clean drying ground. The fruit on the trays should be turned at least every second day to ensure even drying and to prevent figs sticking to the trays. If the fruit is not turned, large figs often develop mould on the underside.

Should wet weather occur, or if dews are experienced at night, the trays must be stacked and covered, for wet fruit ferments quickly.

Under suitable conditions the fruit will usually be dry in four to six days. If, when pressed between the fingers, the fruit will not exude any juice yet is pliable, then it is ready for sweating. Sweating is done by placing the fruit in heaps on a clean floor or by placing into large boxes for about two weeks, during which time it must be stirred up and turned over every three to four days. This evens up the moisture content of the fruit, the over-dried fruit absorbing moisture from the under-dried fruit.

Packing.

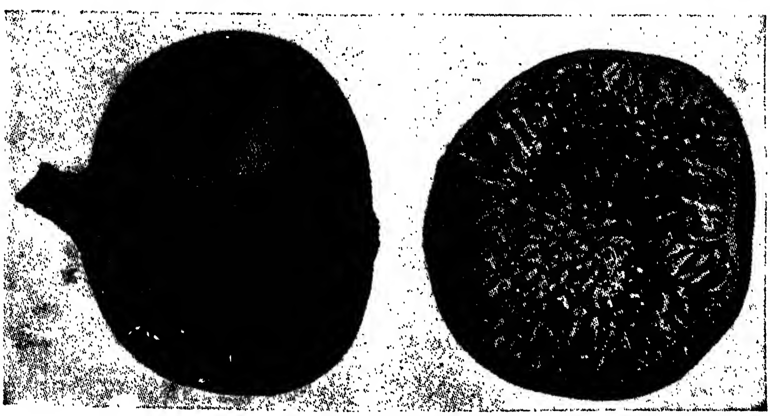
Before being packed, the dried figs are dipped in a cold brine, made by adding 3 oz. of salt to each gallon of water. This removes any dust or dirt that may have collected on the fruit during drying. After dipping,

Sulphur Box Tilted to Show Arrangement of Drying Trays Underneath.

place the fruit on trays in the sun for half a day to dry off excess moisture.

Finally, the fruit is placed in a steam bath for 10 to 12 minutes to soften the skin and improve the texture. This treatment will also destroy insect eggs which might be present. Should steaming be impossible, a boiling brine of the same strength should be used for the final dip instead of a cold brine. In this case, the figs should be immersed for 1 to 3 minutes and then dried in the sun.

(Continued on page 92.)



Ripe Smyrna Fig—Whole and in Section.

THE
BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics.

KEEPING FARM RECORDS.

Good Records Mean Better Farming.

IN the ordinary business world it is a common occurrence for one man to make, if not a fortune then, at least, a sound and substantial income in a particular line of business, while another man in the same type of business, working under similar conditions and in similar circumstances, goes bankrupt. A farm is one type of business and, in farming as in other businesses, it is found that some men achieve success while others are continually battling to "keep their heads above water."

Why is this such a common occurrence? There may be several explanations. In some cases it may be just that one man works hard while another is lazy; or perhaps one man has a sound knowledge of the problems and the techniques of farming while the other has not; or, again, perhaps one man may be doomed to failure from the start because his farm is infertile or badly situated. Any one of these factors MAY be a cause of failure, but more often than not, none is.

The most common reason for failure in business is a lack of business ability on the part of the manager—the man who has to make the decisions. Often the finest craftsman will fail in a business of his own for that reason. It is frequently overlooked that the majority of farmers in this country have a dual role to play; that is, as well as having to do most of the physical work they are also the managers of their farm businesses as a whole. Now, although it is difficult to prove statistically, it is undoubtedly true that more farming failures are due to a lack of business ability on the part of the farmer than to any other single cause.

Of course, it is not to be denied that the farmer meets with far greater difficulties of management than does the average manufacturer or retailer. The latter does not have to contend with the floods, droughts, hail, frost, insect pests, diseases and such extreme price fluctuations as the farmer frequently encounters. But this merely indicates the complexity of the farm business. Although such factors as have been mentioned are often the underlying causes of the severe losses so often sustained by farmers, it is also true that if a farm is conducted on systematic business lines the adverse effects of a bad season, of successive bad seasons, or of a severe fall in price, can, in most cases, be reduced to such an extent that the farmer is able to continue to stand on his own feet. In addition, many farmers who, for one reason or another, have a farm which returns them reasonable living in spite of the fact that their business methods are haphazard and careless, could greatly increase their profits, and conse-

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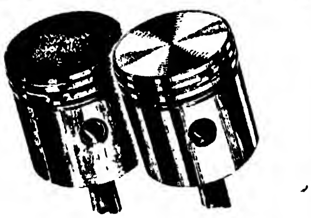

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quently their material comforts in life, if they were to pay more attention to the business side of their farming.

No farm and no business can be managed soundly and economically so as to yield the maximum net profit unless an adequate and reasonably detailed set of records is kept. In the case of the farm business both financial and production records are desirable if maximum efficiency is to be attained. Records in themselves will not make a farmer a business man but, probably without exception, a farmer who keeps adequate records and who studies them carefully will increase his business efficiency and consequently his net profit.

The Records Need Not Be Complicated.

It is commonly thought that any system of farm book-keeping must necessarily be complicated, but it need not be. In fact, all good farm book-keeping systems aim at simplicity; and the system evolved and supplied by this Department, details of which are given at the conclusion of this article, can be readily understood by any farmer who will take just a little trouble to read it up and think it out for himself. There is no doubt that the farmer who takes the trouble to keep and study these records will be well repaid in the long run.

Little Time Required.

On first sight it often appears that compilation of the records will take a considerable amount of time. However, this is not the case. It is true that in the early stages, before he is really used to them, they will take much more of the farmer's time than will be the case after he has been keeping them for a few months. Most farmers find that once they are used to keeping records the work requires less than ten or fifteen minutes of their time per week. Analysing and studying the records at the end of the financial year will take some little time but it is certainly worth while—it would be impossible to find a more profitable way of utilising a wet day.

How the Records Can Help.

In the space of a short article such as this it is impossible to deal in detail with the various uses to which farm records may be put, or in fact, even to list all of the many uses which can be made of such records. For this reason the list and brief comments which follow are not intended to be complete, but merely aim to illustrate some of the ways in which records will help in the conduct of farm business.

Adequate records will—

1. Make it possible to ascertain accurately the profit or loss for the year. This is impossible if reliance is placed merely on cheque butts, bank statements and invoices, as is the practice of so many farmers.

2. Enable the farmer to ascertain the return he is obtaining on invested capital as distinguished from the return obtained for his own labour and management.

3. Enable a comparison of costs from year to year and, in some circumstances, with other farms. By doing this it will often be possible to evolve ways and means of reducing costs or certain items of cost. At a glance the major cash cost items can be seen and any disproportionate increase from year to year can be noted.

4. Enable preparation of income tax returns easily and accurately. This in itself probably makes the keeping of records well worth while. Not only are adequate records a legal requirement insofar as income tax returns are concerned, but the keeping of accurate and detailed records will frequently make it possible to save a very considerable amount in taxation.

5. Enable the supply to local farmers' organisation of a great deal of valuable and authentic information regarding the industry should it be desired. Such information will often prove most valuable to the organisations concerned, and indirectly to the farmer concerned.

6. Provide, over a period of years, a record of prices paid for various requirements and for stock, and a record of prices received for products, as well as a record of the quantities of various items used on the farm and a complete record of production. These details may appear to be of comparatively little value when they are first recorded, but frequent cases have been noted where such information, recorded in definite form, has proved of real value in solving some problem which has arisen, perhaps years later. No matter how good the farmer's memory, he cannot record all the details which might prove unexpectedly valuable in years to come.

7. Over a period of years, enable a farmer to budget with a reasonable degree of accuracy—which cannot be done by reliance on memory. Farm budgeting is an important subject in itself, and it is hoped to devote some space in a future issue to a discussion of this subject.

These are but a few of the uses to which farm records can be put; there are many others. When first keeping records a farmer will probably not appreciate their full value. It is important to realise that a farm records system will not show up to greatest advantage during the first year or two of its use. It is, perhaps, as a reference in after years that it proves of greatest value and, consequently, the longer the records are kept the more valuable they become.

The Department's Farm Record Books.

The Division of Marketing and Agricultural Economics has designed a Record Book which will suit the needs of all farmers who wish to keep detailed financial and production records of their farm operations. The books which will be found reasonably simple, yet quite comprehensive, are designed to be used for the financial year commencing 1st July. Three different editions of the book are available, suitable for: (i) Wheat/Sheep Farms; (ii) Dairy Farms; (iii) Fruit, Vegetable, Poultry and Small Mixed Farms.

Numerous farmers throughout the State have been keeping these books over the last five years, and several improvements suggested by them have been incorporated. From the many expressions of satisfaction received from these farmers the Department feels very confident in recommending these Record Books to the farming community.

Copies of the books may be obtained from the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney, at a nominal charge of 2s. 6d. (post free). When ordering, care should be taken to state the type of farm for which the book is required.

What are Soybeans Worth?

SOME New England farmers are still holding last season's relatively small production of soybeans for an average price of 35s. a bushel. They have been encouraged to expect even higher prices, partly by the sale of a small quantity of soybeans for medicinal purposes at more than £3 per bushel, and also by the statements about the vast possibilities of soybeans, which were, and are, being made.

Approximately 300 bushels of soybeans are required annually for the whole of Australia to manufacture a special preparation used by diabetics. For this purpose price is, of course, a minor consideration, but the mere fact of a high price being paid for such a small quantity should not be taken as an indication that large quantities can be used in this way or sold at such prices.

When larger quantities have to be sold, they can only be crushed and the resultant oil and meal disposed of separately. Soybean oil is a semi-drying oil which can be used instead of edible oils such as peanut oil or instead of paint oils such as linseed oil. The present price of peanut oil is 12s. a gallon, whilst linseed oil is worth 25s. In order to get the highest price, soybean oil has to be used as substitute for linseed and for this purpose it is probably worth 22s. a gallon. Soybean meal can be used for stock feed, glue-making or plastics. It is not very greatly used for plastics in the United States of America and not at all in Australia. The price of linseed meal is approximately £10 per ton and soybean meal could be sold for about the same price but not for more.

Working on these prices and allowing for average processing costs and assuming that soybeans have 17 per cent. oil content, which is, if anything, on the generous side, the net value of 1 ton of soybeans is approximately £45, which works out at 25s. a bushel before any profit is allowed for the oil processor. It seems obvious, therefore, that 35s. a bushel is not a reasonable price for any oil crusher to pay, and it is not likely that any of them will pay so much.

American growers of soybeans receive much less for their beans; in Australian prices, average prices paid to growers per bushel of soybeans in the United States of America were: 13s. 5d. in June, 1946;

(Continued on page 87.)

THE COOL STORAGE OF PEARS.

E. G. HALL, B.Sc.Agr., Fruit Research Officer.*

IN the storage of pears a reasonable criterion of success is the degree of realisation of the maximum possible storage life for the variety, account being taken of seasonal and locality variations in keeping quality. Storage life is defined as the maximum period for which the fruit can be kept and still ripened satisfactorily after removal to ripening temperatures.

Successful storage of pears depends on picking at the correct time, placing in storage without delay, cooling down quickly, maintenance of a uniform temperature of 29-30 deg. Fahr. during the cool storage period and removal of the fruit at or before the first sign of over-storage.

When to Pick.

For longest storage pears should be picked from the tree as soon as the fruit is fully developed, and while it is still hard and green to dark-green in colour. There is no single completely reliable criterion of maturity, but it has been found that the best practical guides to maturity are colour of the skin and firmness of the flesh and, for a particular district, calendar date, allowance being made for early and late seasons.

At the correct stage for picking the colour of the skin will have lightened from the deep-green of immaturity to a uniform green colour (cosse green, plate 19L5-6 in Maerz and Paul's Dictionary of Colour—McGraw Hill Book Co., N.Y., U.S.A., 1930). At this stage the firmness of the flesh, as measured with a standard United States fruit pressure tester[1] fitted with a plunger 5/16 inch in diameter, should be between 15 and 22 lb. Average values for the main varieties are given in Table 1. If the skin is deep-green in colour and the firmness of the flesh is greater than the maximum values shown in Table 1 the pears are likely to be immature and not fit for picking. If the skin shows signs of yellowing to a yellow-green colour (more coloured than Maerz and Paul plate 19L4) and the firmness of the flesh is less than the minimum values given in Table 1, they are likely to be over-mature and not suitable for long storage. In the case of russetted varieties the true colour of the skin can be ascertained after gently scraping off the surface layers.

Immature fruit may have a long storage life, but is liable to shrivel excessively during storage and will not ripen with good development of juice and flavour. Pears picked after the optimum stage for storage will ripen to excellent quality but their storage life will be relatively short and there will be considerable risk of over-storage with subsequent development of scald and breakdown.

There are certain other indications of maturity which are valuable supplementary aids. At the optimum stage the fruit is easily removed from the tree, the stalk readily separating from the spur. If the fruit on the tree has been sprayed with hormone preparations, which are used to prevent pre-harvest drop, the fruit is often difficult to remove from the tree without breaking the stalk, so that ease of removal is of no value as a guide to the maturity of sprayed fruit. The fact that hormone-sprayed pears do not drop should not be allowed to influence the time of picking. The use of hormone sprays does not delay maturation and there is some evidence[2] that they tend to hasten ripening, both before and after harvest. Therefore, hormone-sprayed pears should be picked at the same time as unsprayed fruit, or even a little earlier, and over a shorter period and stored without delay.

At the correct stage for picking the flesh, while still hard, will be showing some development of sugar and juiciness. When a fully developed pear is cut across there will be a slight exudation of juice on the cut surface; if the cut surface remains dry it is probable that the fruit is immature. Changes in the colour of the seeds are not a reliable guide to maturity.

In Victoria it has been found[3] that, in a particular district, the most generally reliable guide as to when to pick is calendar date.

* An officer of the Division of Food Preservation and Transport of the Council for Scientific and Industrial Research.

In investigations extending over several years it was found that the optimum time for picking did not vary from year to year by more than about a week. In New South Wales, however, there appears to be greater variability, perhaps because of greater differences in weather between seasons. Nevertheless, calendar date should be taken into account.

In conclusion it may be said that greatest reliance should be placed on colour and firmness, but the careful grower will consider all factors when deciding whether his fruit is ready to pick.

Quick Cooling.

With pears rapid cooling down to storage temperature as soon as possible after picking is essential to obtain maximum life. For example, it was found[3] that the life in air at 32 deg. Fahr. of Williams pears placed in storage twenty-four hours after picking was thirteen weeks, and that a further delay before storage of two days at 75 deg. Fahr. reduced the life to five weeks, and also that two days at 65 deg. Fahr. reduced the life to six weeks. The effect of delay is not so severe with later varieties, but two days delay at 65-75 deg. Fahr. would probably reduce the life at 32 deg. Fahr. by a month.

Rapid cooling involves not only placing in storage without delay, but also picking the fruit when it is coolest and making provision for quick removal of sensible heat after placing in the cool storage room. The aim should be to get the fruit into storage on the same day as it is picked or early the following morning, and to bring the pulp temperature down to 45 deg. Fahr. within 24 hours after placing in the cool store.

Useful gains in keeping quality can be made by picking pears early in the morning before the sun has had time to heat the fruit after the cooling effect of the lower night temperatures. When early morning picking is impracticable it is often worthwhile to leave the boxes of fruit under the trees over-night and collect them early in the morning, thus using the lower night temperatures to remove some of the heat from the fruit and so reduce the load on the refrigeration equipment. It is also important to ensure that the fruit gains a minimum of heat between picking and placing in storage. The field cases should be placed in the shade of the tree as soon as filled by the picker and be kept in the shade or in a well-ventilated shed until delivery to the cool store.

Advantage of Storing Fruit Unwrapped.

It is an excellent practice to put pears destined for long storage straight into the cool store in the picking boxes, loose and unwrapped; this method is used by the most successful storers of pears and is well worthy of universal adoption. When the fruit has been cooled to storage temperature the cases can be taken out and the fruit graded and packed as quickly as possible and returned to the store without the temperature of the fruit rising enough to affect the storage life appreciably. In some stores the fruit is not graded and packed until it is removed for marketing at the end of the storage period. This is quite satisfactorily if the fruit is still in good hard condition but if it has started to soften, even slightly, handling is likely to cause some blemishing of the fruit. It has been shown[4] that the development of skin blemishes on pears graded and packed when cold from the cool store was related to their maturity, and not to the fact that they were cold. It is of interest that the practice of the most successful Victorian growers who specialise in long storage of pears is to size grade, preferably by hand, before storage and to pack at the end of the storage period, just before marketing.

The first special advantage of putting the fruit into store loose and unwrapped is that cooling is done more rapidly than when the fruit is wrapped and packed. With loose, bare fruit in the standard Canadian bushel case with strawboard linings or in unlined or lined kerosene cases it is quite practicable[3], in an air circulation or a well-designed natural circulation (coiled only) store to reduce the pulp temperature from 70 deg. Fahr. to 45 deg. Fahr. in 24 hours; wrapped and packed fruit, will take about two to three times as long to cool.

Secondly, the delay between picking and cooling can be reduced to a minimum, and thirdly, tighter packs can be obtained at the end of storage since the unavoidable shrinkage due to water loss which takes place in storage, and which is more rapid during cooling, mainly occurs before packing. A fourth point which is often most important is that full attention can be paid to picking. Time spent on packing before storage often

means that, with the labour available, the whole of the crop cannot be picked at the correct time. It has often been the experience that packing before storage has so delayed harvesting of part of the crop that the fruit has been past optimum maturity for storage when picked and its keeping quality has been reduced.

Influence of Store Design and Management.

Cool store design and management are important in regard to rapid cooling. For the rate of heat removal from warm fruit to be satisfactory there must be ample reserves of refrigerating capacity above that required to maintain steady conditions during storage. This not only means compressor capacity, but also adequate cooling surfaces in the rooms or in the batteries.

If possible the rate of intake of warm fruit into the storage room should be no more per day than 10 per cent. of its total capacity. It is a definite advantage to distribute each day's intake of fruit in several positions around the room, especially where air circulation is by natural convection only. More of the available refrigeration can then be turned on without danger of freezing in some parts of the room and there are no big stacks of warm fruit which cool more slowly. Cooling can further usefully be speeded up by the use of auxillary portable fans.

The usual practice in regard to stacking the cases in the cool storage room is to put them straight on the floor without floor dunnage and to maintain an air space of about one inch on all sides of each column of cases. Our present knowledge, which is rather limited, does not indicate any serious objection to this practice. In order to maintain the stability of the stack without losing the vertical air spaces a number of stores have found the use of vertical dunnage after every third column of cases to be a worthwhile precaution. Horizontal dunnage does not seem to be really necessary at any time, but floor dunnage may be useful when wrapped and packed fruit is being cooled. A space of at least 4 inches should be left between external walls, and also between any internal walls against a warm space, and the stack of fruit.

Because of likely differences in behaviour, each grower's fruit should be stacked separately and it is good practice to have, as far as possible, only one variety in a room.

Storage Conditions for Pears.

Air Storage.—In ordinary cool storage the air temperature should be maintained at 29-30 deg. Fahr.; at higher temperatures storage life is decreased and at lower temperatures there is some risk of freezing. It has been found, particularly with the Williams variety, that the life at 32 deg. Fahr. is significantly shorter than the life at 30 deg. Fahr. and at 34 deg. Fahr. the life may be little more than half that at 30 deg. Fahr. In practice the operator of the store should aim at an air temperature as close to 29 deg. Fahr. as possible while avoiding freezing. This means that the less uniform the temperatures in different parts of the room the more the average temperature must exceed 29 deg. Fahr.

The relative humidity in the store should be high enough to avoid shrivelling during storage; the optimum level is about 90 per cent. This can only be maintained in a well-insulated store with ample cooling surfaces. In an average store, when well filled, a satisfactory relative humidity of 85 per cent. can be maintained. It should be noted too, that fruit stored unwrapped will shrivel more than wrapped and packed fruit and immature fruit will shrivel more than fruit picked at the correct stage of maturity.

Gas Storage.—Pears, particularly the Williams variety, respond well to gas storage. Storage in an atmosphere containing 5 to 7 per cent. of carbon dioxide and, correspondingly, 16 to 14 per cent. of oxygen will considerably increase the life of the fruit. It has been found that the life of Williams pears gas stored at 32 deg. Fahr. can be as much as twice that of similar fruit stored in air at the same temperature. In experimental storage carried out by this Division the life at 32 deg. Fahr. of Packhams has been increased from 4 to 5 months to as much as 6½ to 7 months by gas storage and considerable increases have been observed with other varieties, with the exception of Josephine which has not responded well to gas storage.

A further advantage is that fruit from gas storage ripens more slowly after removal than does fruit from air storage. Gas storage atmospheres containing more than 7

Fig. 1.—Scald due to Overstorage.
[Photo: P. R. Maguire.

per cent. of carbon dioxide are not recommended because of risk of injury to the fruit. Gas storage as above at a temperature of 31 to 32 deg. is recommended for longest storage, of Williams, Bosc and Packhams particularly. The effects of gas storage at 29 to 30 deg. are not known.

Successful gas storage requires a specially constructed gas-tight room from which the leakage is sufficiently low to enable the required atmospheres to be obtained. It is not practicable to construct completely gas-tight rooms but the "gas efficiency" of the store should not be less than 0.90. This means that no more than 10 per cent. of an initial content of carbon dioxide, introduced into the empty room, should leak out in a 24-hour period. A continuous metal lining provides the best gas seal, but a room can be satisfactorily gas-proofed by thorough application of a bitumen emulsion such as Flintkote or of crude petroleum jelly. Synthetic enamels such as Dulux machinery finish and also shellac are useful gas-proofing materials.

Picking at the correct maturity and rapid cooling, as discussed previously, are just as important for gas storage as for air storage. The gas store should be closed as soon as filled, care being taken that the door is well sealed, and the carbon dioxide concentration allowed to build up to the desired level by accumulation in the store of the gas given off by the fruit. This level is maintained during storage by controlled ventilation as required.

Overstorage.

Pears which have been kept too long in storage fail to ripen normally after removal to ripening temperatures. When overstored, pears commence to turn yellow and may develop scald while still at low temperature. Overstored fruit, when removed, will colour but will not soften or develop juice or flavour; scald and core breakdown develop and the flavour becomes fermented. Typical specimens of scald and core breakdown are illustrated in Figs. 1 and 2.

When only slightly over-stored the fruit will soften, but juiciness and flavour will be poor and scald may develop. To avoid overstorage pears should be removed while still hard and while still green to light-green in colour. It is a good plan, towards the end of the storage period, to remove small samples at weekly intervals for ripening tests at a temperature of 60 to 70 deg. Fahr. The first sign of falling off in quality when ripe should be regarded as a warning of approaching overstorage and steps should be taken to market the remainder of the fruit. With Williams this allows a safety period, until overstorage, of 2 to 3 weeks, and with later varieties about 4 to 5 weeks.

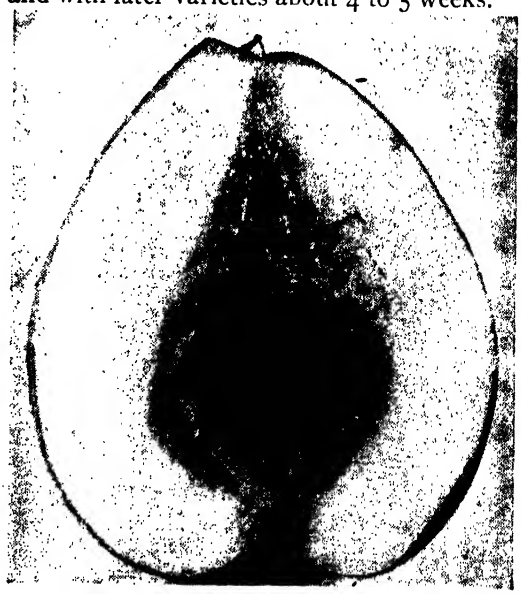
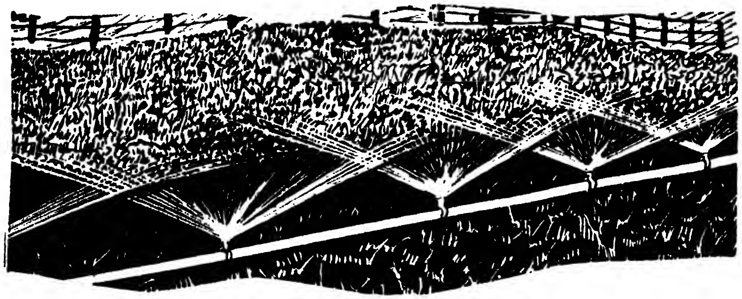
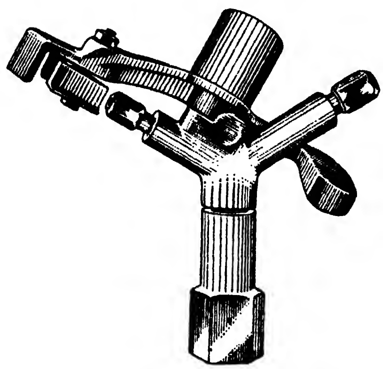


Fig. 2.—Core Breakdown after Removal from Store. Due to overstorage.
[Photo: P. R. Maguire.





Ripening.

For best quality, pears should be removed from storage while still hard and green to yellow-green in colour and ripened after storage at a temperature of 60 to 70 deg. Fahr. A temperature of 65 deg. has been found to be about the optimum for all varieties tested. Williams pears have only a narrow range of temperatures at which they will ripen, the minimum temperature for satisfactory ripening being 60 deg. Fahr. The minimum ripening temperatures for the other main varieties are: Bosc 55 deg., Packham 45 deg., Josephine, Winter Cole and Winter Nelis 40 deg. Although satisfactory, the quality when ripened at these temperatures will be inferior to those of fruit ripened at 60 to 70 deg. Fahr.

TABLE I.—PICKING DATA AND STORAGE LIFE OF THE MAIN VARIETIES.

Variety.	Usual Picking Date in Main Districts.		Firmness at correct maturity in pounds.	Average safe commercial storage life in weeks at—			
	New South Wales.	Southern Victoria.		30°F.	32°F.	34°F.	Gas at 32°F.
Williams	10–20 Feb.	5–10 Feb.	17–22	11–12	9–10	7	16
Bosc	End Feb. to 1st week March.	End Feb. to 1st week March.	15–19	18	16	13	20–22
Packham ...	Mid-March	End Feb. to 1st week March.	15–19	20–24	16–20	13–17	22–26
Josephine ...	2nd–3rd week in March.	Mid-March	1[illegible]-17	20–22	18–20	16–18	20–22
Winter Cole ...	2nd–3rd week in March.	2nd week March ...	14–16	24–28	20–24	16–20	28–32
Winter Nelis ...	3rd–4th week in March.	3rd week March ...	17–18	26–30	22–26	20–24	28–32

Storage Life.

In Table 1 are given data on the picking maturity and storage life of the main varieties. The data refer to average seasons and the length of storage life is what could reasonably be expected in an average store. Under the best conditions of handling and storage or in a good keeping season these periods could be exceeded, and in a season unfavourable to keeping quality the life would be somewhat less.

References.

[1] ALLEN—1929, Univ. Calif. Agri. Exp. Sta. Bull. 470.

[2] ALLEN & DAVEY—1946, *Fruit Prod. J.* 25, 12, 370-372.

[3] ROSTOS, G. R.—unpublished data.

[4] SMITH, 1946—*Proc. Am. Soc. Hort. Sci.* 47, 79-83.

[5] TINDALE, Trout and Huelin, 1938, *J. Dept. Agr. Vic.* 36, 34-52, 90-104.

Acknowledgment.

Mr. G. R. Rostos, of C.S.I.R., Division of Food Preservation, for information on cool store design and management.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Guyra	February 13, 14
Yass	February 13, 14
Bundarra	February 14
Boorowa	February 17, 18
Mendooran	February 19
Inverell	February 20, 21
Dunedoo	February 25
Newcastle (P. G. Legoe)	February 25, 26, 27, 28
Comboyne (W. R. Cooke)	February 26, 27
Dorrigo (W. Tomlinson)	February 26, 27
Bega (Jas. Appleby)	February 26, 27, 28
Armidale	February 26, 27, 28
Tenterfield	February 26, 27, 28
Moss Vale (T. H. N. Binney)	February 26, 27, 28
Queanbeyan (Darcy Vest)	February 27, 28
Gulgong	February 27, 28
Walcha	March 2, 3
Glen Innes (M. R. Aggs)	March 2, 3, 4
Uralla	March 5, 6
Manilla	March 5, 6
Warialda	March 5, 6
Mudgee	March 5, 6
Taralga	March 9, 10
Tumbarumba (Mrs. Roy O'Shea)	March 9, 10
Tamworth	March 9, 10, 11
Cumnock (C. Reynolds)	March 10
Bingara	March 10, 11
Goulburn (Fergus Isaac)	March 11, 12, 13
Blayney (K. Gressor)	March 12, 13
Rylstone-Kandos	March 13
Quirindi	March 13, 14
Bulahdelah (C. Wilson)	March 19, 20
Sydney Royal	March 20 to 31
Gloucester (Mrs. M. A. Newton)	April 9, 10
Kempsey (A. Slack)	April 6, 7, 8
Binnaway	April 7
Macksville (D. Turner)	April 9, 10
Barraba	April 9, 10
Bellingen (C. P. Franey)	April 12, 13
Coonabarabran	April 13, 14
Orange	April 13, 14, 15
Grafton (C. W. Creighton)	April 15, 16, 17
Gunnedah	April 15, 16, 17
Hawkesbury District (Clarendon) (T. J. Cambridge)	April 15, 16, 17
Boggabri	April 20, 21
Baradine	April 20, 21
Narrabri	April 23, 24
Urbenville (S. Stoddart)	April 23, 24
Dungog	April 30, May 1
Trangie	May 4, 5
Gilgandra (A. Christie)	May 18, 19
Sydney Sheep Show	June 2, 3, 4, 5
Cootamundra Sheep Show	June 22, 23
Wagga	August 24, 25, 26
Narrandera	September 10, 11
Cootamundra (D. H. Boyd)	October 15, 16

Approved Vegetable Seed—February, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Varieties Listed—continued.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, "Sherwood Farm," Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Hunter River Brown—R. C. Morandini, Box 74, Dubbo.

Crystal Grano—R. C. Morandini, Box 74, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

PLANT DISEASES

Notes contributed by the Biological Branch

DISEASES OF DAFFODILS.

ALL the destructive diseases affecting plants of the Narcissus tribe can be carried in the bulb. It is necessary, therefore, when buying bulbs to examine them with care for disease symptoms. It is also highly desirable to grow new bulbs, for the first season, in quarantine in a position isolated from any established healthy stocks.

There are three important diseases affecting daffodils in New South Wales: the fungous disease basal rot, the eelworm disease and the virus disease, mosaic or stripe.

Basal Rot (*Fusarium bulbigenum*).

This is at present the most destructive disease of daffodils in New South Wales. Losses are most serious in heavy soils where drainage is poor.

Affected bulbs when cut in halves show a firm brown rot of the basal plate and scales (Fig. 1). The parasite, which is a soil-inhabiting fungus, gains entry through dead root bases to the basal plate and bulb scales. or through wounds at the beginning of or at any time during dormancy. Affected bulbs, if planted, rot in the soil without germinating or produce weak, yellow plants which ultimately die. The disease is introduced into uninfested soil in this way and it spreads through the soil by natural means and by being transferred from infected to new areas during cultivation.

The disease may not be visible at the time of lifting, but if its presence is suspected in the crop the bulbs should be lifted as soon as the leaves yellow off naturally, dried in a cool place for several days, cleaned, and soaked for two hours in formalin solution (1 pint formalin to 25 gallons of water). The bulbs should then be dried out and stored on racks or trays in a cool, dry place. Early lifting and thorough drying out is

Fig. 1.—Basal Rot.

Affected bulb cut in halves to show the decay advancing from the basal plate upwards through the scales.

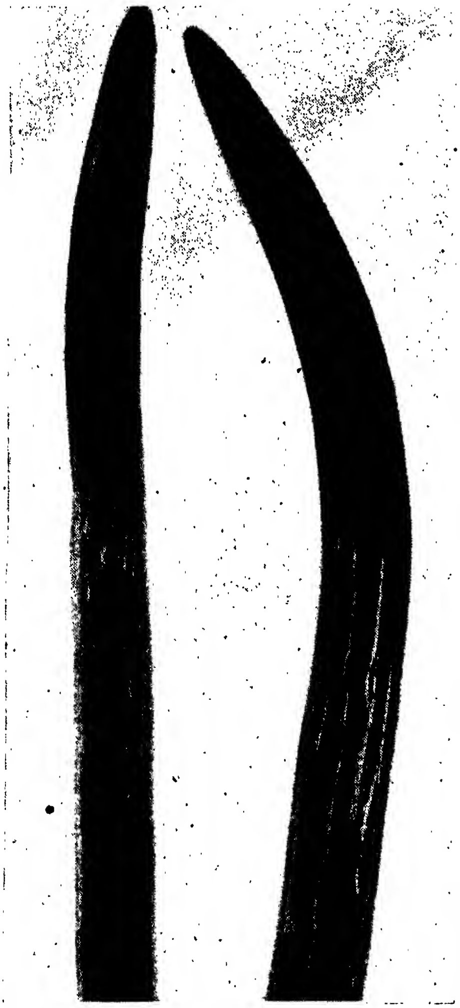


Fig. 2.—Bulb Eelworm.
Leaves showing raised, blister-like streaks.

Fig. 3.—Bulb Affected with Eelworm.
Cut in halves to show browning of scales.

essential since if the soil is wet, the warm conditions of summer and autumn are ideal for the spread of the disease.

Before planting all bulbs should be examined for signs of rot, and any diseased

Fig. 4.—Rings in Neck of Bulb Affected with Eelworm.
[*After McWhorter and Weiss.*

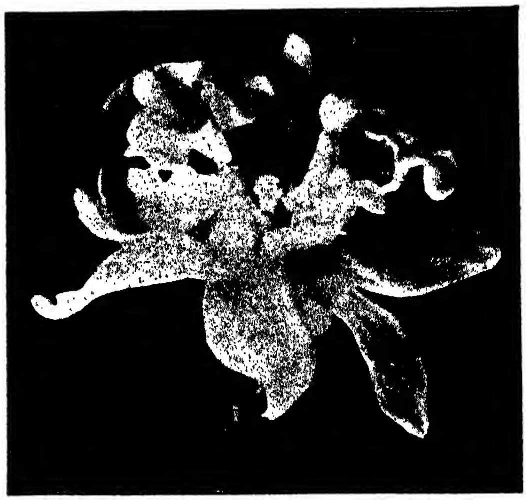


Fig. 5.—King Alfred Daffodil.
Note injury to trumpet and other malformation of flower as result of faulty heat treatment.

specimens should be burned. A slight infection may be quite difficult to detect. The best way is to examine the basal plate of each bulb carefully, and if the rim where the new roots originate is white and firm, the bulb is probably healthy. If, however,

there is any trace of browning, remove the outer scales to see whether the rot has extended into the fleshy part of the bulb. Often apparently healthy bulbs will have a slight infection.

Soil in which a diseased crop has grown should not again be used for daffodils for about five years.

Until all trace of basal rot is cleared out, bulbs should be lifted and inspected and treated with formalin each year.

No hormone preparation should ever be used on bulbs because of the risk of encouraging basal rot. Heavy dressings of nitrogenous fertilizers should be avoided for the same reason.

Bulb Eelworm or Nematode Disease (*Anguillulina dipsaci*).

This disease is caused by a small parasitic worm-like organism which infests the bulbs and foliage. The leaf symptoms may be confused with stripe (see page 86) and the bulb symptoms with basal rot. The organism enters the bulb through the neck and causes a brown decay of the bulb scales (Fig. 3). If the bulb is cut across transversely, characteristic brown rings can be seen. Badly affected bulbs are soft and spongy.

The foliage produced by infected bulbs is twisted and distorted, often pale, with raised lumps or thickenings easily felt if the leaf is drawn between the fingers.

The disease usually shows up in field crops as patches, with a badly affected plant in the centre. If the crop is not lifted and treated the disease will spread gradually throughout it.

Eelworms in the leaves pass down into the bulb scales, or remain as eggs in bulb refuse in the soil.

Treatment.—Infection can be eliminated from the bulbs by a hot water treatment as follows: All bulbs in an infected bed should be lifted and treated. Lift as soon as healthy foliage has died down naturally. Cut off the leaves about 1-2 inches above the nose of the bulb and burn. Place the bulbs in shallow layers in boxes, or spread out on wire netting frames in a cool, airy place, and allow to dry out thoroughly for 4-6 weeks. At the end of this period when the bulbs are thoroughly dormant, they should be given the hot water treatment.

A specially constructed hot water bath with thermostat to control water temperature greatly facilitates treatment, but small lots can be treated in an ordinary domestic copper provided great care is exercised. ***An accurate thermometer is essential,*** as failure to adjust the temperature correctly may result in lack of flowering or in malformation of the blooms (Fig. 5). The treatment is a 3-hour soak at a temperature of 110 deg. Fahr. The temperature of the bath should be raised at first to about 120 deg. The bulbs should be cleaned, and any obviously rotted or soft bulbs burned. They should be placed

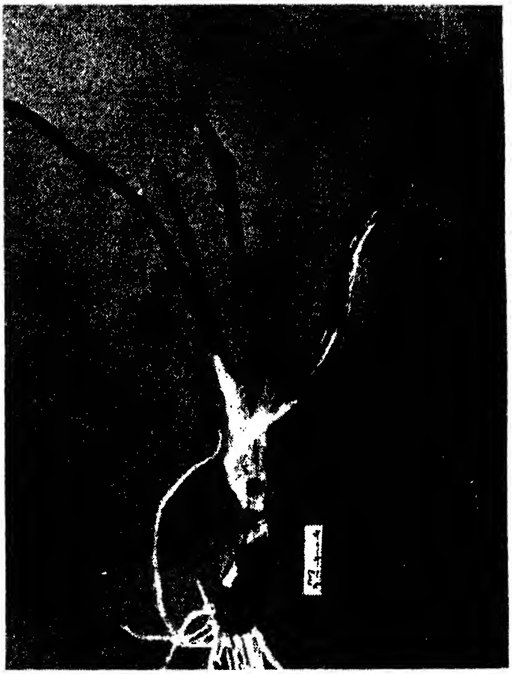


Fig. 6.—King Alfred Daffodil Badly Affected with Virus Disease.
Note the mottled, distorted leaves.

in a wire basket (not a sack) and plunged into the hot water. The temperature will then fall, probably below the required level. It should be maintained at 110 deg. by the addition of hot water from time to time, and stirred to keep an even temperature throughout the bath. At the end of the treatment remove the bulbs and allow to cool gradually.

Basal rot, if present, will spread during the hot water treatment. To prevent this, formalin can be added to the hot water at the rate of 1 pint to 25 gallons. Alternatively, when the bulbs are cool they can be

given the cold formalin soak described under basal rot.

The bulbs may be planted immediately after treatment or can be dried out and stored.

Every precaution must be taken against reinfection of treated bulbs from diseased bulb refuse, benches, containers, contaminated soil, etc.

Fig. 7.—Narcissus Scorch.

[After Moore.

Treated bulbs must be planted in clean soil. Infested soil should not be planted to daffodils for three years, and during that period volunteer daffodils should be dug up and burned, and onions and the common weed, *Plantago lanceolata* (lamb's tongue or plaintain) should not be permitted to grow. Tools used for working infested soil should be cleaned and dipped in boiling water.

The growing crop should be examined periodically for eelworm symptoms (these can be seen most easily on a dull day) and any infected plants dug up and burned, with a spade-full of the surrounding soil.

Stripe, Mosaic or Grey Disease (virus).

There appear to be two virus diseases of daffodils in New South Wales, a relatively mild mosaic causing an indistinct mottling of the foliage, and a severe type causing yellow or silver-grey stripes often accompanied by malformation and one-sided yellowing. In the ageing leaves the stripes may become brown. The stripes and mottled areas are not raised and lumpy as in eelworm disease.

Some varieties remain fairly vigorous and productive in spite of infection; others, however, gradually deteriorate.

The disease is spread from infected to healthy plants by aphids. There is no cure.

The crop should be inspected at intervals during the growing season, preferably during dull weather, and any infected plants dug up and burned. Periodic spraying for aphid control is recommended.

Leaf Scorch (*Stagonospora curtisi*).

This disease has only recently been recorded in New South Wales, and it is not known whether it is likely to be important under our conditions. It also attacks hippeastrums and crinums.

Symptoms.—The leaf tips become scorched and reddish-brown soon after appearing above the soil. Under moist conditions the disease spreads downwards as the leaves grow, producing elongated brown spots. The part of the leaf above the spots yellows and dies.

Treatment.—Soak the bulbs in formalin as described for basal rot. Spray the growing crop with Bordeaux mixture, 4-3-40, plus white oil, 1 fluid oz. per gallon, several times at fortnightly intervals if the weather is inclined to be wet.

Whiptail of Cauliflower.

Experiments with Sodium Molybdate.

WHIPTAIL of cauliflower is a disease which is sometimes responsible for serious losses in commercial crops. It is characterised by narrow, ruffled and distorted leaves, and occurs most commonly in the short season varieties of the Snowball and Nugget type, more especially in dry seasons and where

heavy applications of nitrogenous fertilizers, such as sulphate of ammonia, are made.

The disease occurs as a rule only on acid soils. Where the soil is acid the disease can usually be prevented by the application, some months before the crop is planted, of lime or dolomite so that the soil reaction is changed to neutral or mildly acid. On most previously unlimed soils 1½ to 2 tons of lime or dolomite per acre are required.

Following investigations in New Zealand in which it was shown that whiptail of cauliflowers was apparently due to a deficiency of molybdenum, an experiment was carried out in the 1947 season on the property of Mr. J. Smith, Cornwallis, Windsor. In this experiment, which was largely the work of officers of this Department stationed at Hawkesbury Agricultural College, an application of sodium molybdate at the rate of 1 lb. per acre was effective in preventing whiptail whilst ¼ lb. per acre was insufficient.*

Further experiments are being carried out in the coming season and will include not only field applications of soluble compounds of molybdenum, but also seed-bed applications. This latter experiment is to be conducted because it is thought that it may be possible to secure sufficient uptake of molybdenum by the cauliflowers in the seedling stage for the growth of the crop right through to maturity.

The investigations have not proceeded sufficiently far for any definite recommendations to be made to growers, and it is possible that the present recommendations in regard to the use of lime and dolomite may still remain the most economical and effective method of preventing whiptail.

Ammonium molybdate and molybdic acid should be just as effective as sodium molybdate in supplying the trace amounts of molybdenum required, and as these two materials are cheaper than sodium molybdate, they will probably be used if an

Whiptail of Cauliflower.

effective and economical method can be worked out. The role of lime or dolomite in preventing whiptail appears to be making the molybdenum present in the soil more available, since it is known that molybdenum tends to be less available for uptake by plants in very acid soils than it is in mildly acid soils or in soils having a neutral or alkaline reaction.

*This experiment is reported in more detail in the December, 1947, issue of the *Journal of the Australian Institute of Agricultural Science.*

The Business of Farming—*continued from page 76.*

22s. 5d. in April, 1947; 18s. 7½d. in May, 1947; and 19s. in June last year.

Present prices for Manchurian soybeans are higher than this but local crushers cannot afford to buy at these overseas prices.

The conclusion seems inescapable that the local market will not pay more than approximately 25s. a bushel for soybeans. Even this price is unlikely to last indefinitely.

Visit the Department of Agriculture's Court at the Royal Show.

INSECT PESTS.

Notes contributed by the Entomological branch.

PARASITES OF GRASSHOPPERS.

SEVERAL species of flies belonging to the families *Tachinidae* and *Nemestrinidae*, parasitise grasshoppers and a chalcid wasp belonging to the family *Scelionidae* attacks the eggs of the Australian Plague Locust.

When grasshoppers are parasitised they become enfeebled, and as a result cannot hop or fly any distance. They are thus unable to resume their flight with the main swarms, and as a result are generally observed after the main swarm has passed on. The percentage of parasitised hoppers, therefore, is often thought to be considerably higher than it actually is.

A Common Parasitic Fly.

The most commonly found species of tachinid fly that attacks the Australian plague locust (*Chortoicetes terminifera*), is *Locustivora pachytyli*, and as many as four maggots of this fly may be found in an individual hopper.

The maggots are elongate, cylindrical and taper towards the head end. They appear to feed mainly in the thoracic region of the hopper, and when fully-fed eat their way out through the body wall of their host and burrow into the soil. There the maggot's skin hardens to form a brown puparium, within which the maggot enters its pupal or chrysalis stage. The hoppers die either shortly before or just after the emergence of the maggots from their bodies. Although the winged hoppers are usually attacked, some fly maggots have been obtained from immature hoppers.

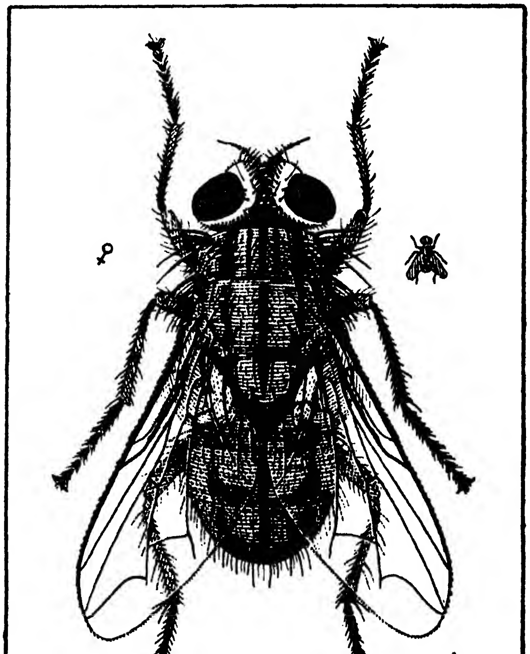
The female fly, which measures about 1/5th inch in length, is greyish with darker markings; the males are considerably larger, and have much wider black markings on their bodies.

Another allied species of fly, *Helicobia australis*—slightly larger than the common house fly which it closely resembles—has also been bred from the plague locust.

Another Parasitic Fly.

The maggots of another species of fly, *Trichopsidea ostracea*, also develop in the plague locust, but this nemestrinid fly, which is known to occur in various parts of Australia, Tasmania and New Guinea, appears to be uncommon.

The maggot of this fly measures about ½ inch in length and is pale yellowish in colour. It is thick-bodied and tapers sharply

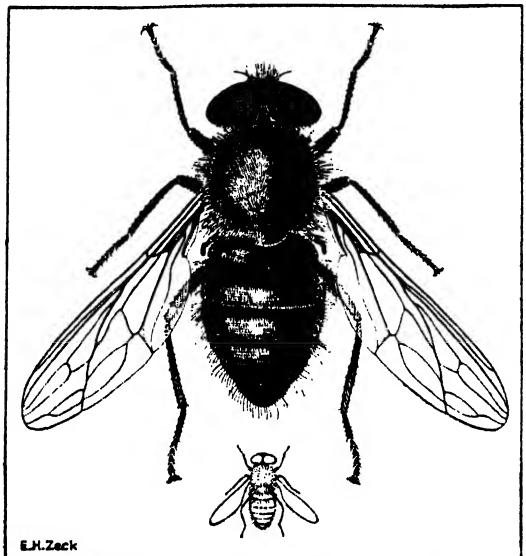


The Common Tachinid Fly Parasite of the Australian Plague Locust.

towards the head, in contrast to the maggots of the previously mentioned species of parasitic flies. This maggot, also, has a series of broadly-pointed protuberances on the body segments.

The pupa, which measures about ½ inch in length, is dark brown and elongate in form. The segments of the abdomen and the developing wing-buds of the fly are readily seen.

The adult, which measures about ½ inch in length, is densely covered with very fine short hairs, and its general colour is yellowish-grey.



A Nemestrinid Fly Parasite of the Plague Locust.

Under laboratory conditions, a maggot of this fly survived, without food, for a period of over a year, and for the most part of that time was in dry soil. It seems probable, that in nature, when climatic conditions are unfavourable, such as during a drought, the maggots of this parasitic fly may be able to survive, beneath the ground, for very long periods.

Although the abovementioned native species of flies may eliminate numbers of plague locusts, they do not prevent these insects from reaching plague numbers.

Flies which Develop in Dead Grasshoppers.

Two species of scavenger flies have been bred in numbers from decomposing plague locusts, and at times these have been mistaken, by pastoralists and others, for parasites.

One of the flies, *Muscina stabulans,* resembles a very large house fly, and the other, *Sarcophaga depressa,* is a grey-bodied fly with black stripes on the thorax and dark mottled markings on the abdomen.

An Egg Parasite of the Plague Locust.

This chalcid wasp, *Scelio fulgidus,* is known to occur in Queensland, Victoria and South Australia, as well as in New South Wales, in which State it has been collected from all the locust-infested inland districts. It is an active insect, running and flying very rapidly, and may be seen climbing up grass stems or disappearing into cracks in the ground.

It may be observed running over the ground at the time the first of a large swarm of hoppers commence to dig their egg-tunnels, and during egg-laying operations, may be seen running about amongst the hoppers. At times the wasp may be seen to crawl beneath the thorax of the laying hopper, and there await the completion of oviposition, and then immediately make its way down to the eggs. Where earth has fallen into the tunnel the wasp uses its legs to dig down until it reaches the dried secretion which covers the egg-pod.

The wasp then eats out a rounded tunnel through the secretion, and works its way down alongside the uppermost eggs. It then turns round and inserts an egg into one of the hopper's eggs. The parasite continues to work down, and deposit its eggs, until eventually the lowest eggs in the batch are parasitised. Generally only one egg is placed in each hopper egg, and where more are deposited only one parasite larva survives in each.

The greatest parasite activity occurs during the first 24 hours after the hoppers have deposited their eggs, and very few wasps have been found on egg-beds examined seven days after the hoppers have laid.

The minimum life-cycle from egg to adult may be as short as three weeks. The adults are not long lived, but more than 200 eggs may be deposited by an individual female.

The fully-fed larva, which measures about 1/5th inch in length, is greyish-green in colour, and is smooth and glistening. By the time this stage has been reached, most of the contents of the hopper egg have been

devoured and the larva then enters its pupal or chrysalis stage within the shell.

On transforming into an adult, the wasp makes an opening in one end of the egg-shell and forces its way up to the surface of the soil, emerging through a small, irregular hole in the ground. Where parasites are numerous the surface of the ground may be marked by vast numbers of these minute emergence holes, which are in marked contrast to the larger circular holes from which young hoppers have emerged.

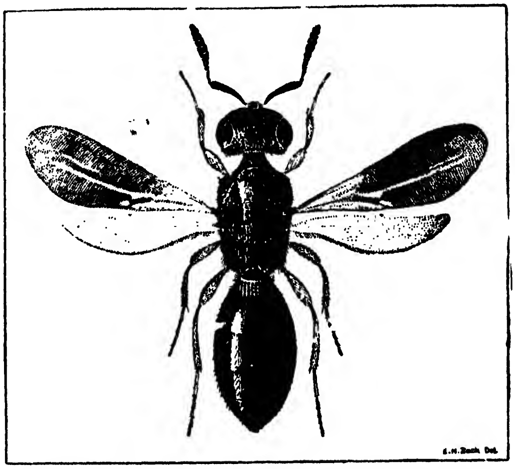
The female wasp, which measures about 1/7th inch in length, has a glossy black body and reddish legs, and the forewings are slightly smoky. The antennae are 12-segmented.

The male resembles the female in general appearance, but the legs are darker, the forewings are clear, and the antennae are 10-segmented.

From observations made, it is indicated that the first adult wasp parasites commence to emerge at about the time that the hoppers from the same egg-beds hatch, but the adult wasps may lie within the hopper eggs for a period of several months, and, as the wasps are not long-lived, this ensures that they will be present at the time the hoppers have reached maturity and commenced to lay eggs.

The hopper eggs which are laid in the autumn, lie in the soil throughout the winter, and hatch in early spring, and the parasites pass this period within the hopper eggs. The life-cycle of the parasite in over-wintering hopper eggs may be as long as ten months.

The number and effectiveness of this parasite vary greatly in different parts of the same district, and in different parts of the State. In some instances, whole egg-beds

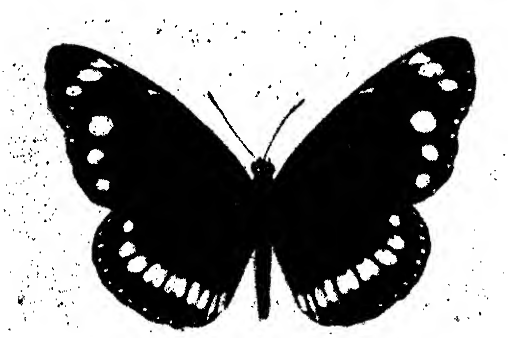


The Common Chalcid Wasp Parasite of the Plague Locust.

may be destroyed by the wasps, while in others the amount of parasitism may be very low. It is evident, that although this native wasp parasite may be a factor in locust control, it is incapable of preventing the occurrence of periodical plagues of locusts.

An Oleander Butterfly *(Euploea corinna)*.

DURING the past month this butterfly has occurred in numbers in the metropolitan district and in various northern and western areas of the State. It is a member of a tropical genus of butterflies and is the only species found as far south as Sydney. In early January of this year, however, specimens were received from as far south as Albury, on the southern border of the State.



The Oleander Butterfly.
Slightly less than actual size.
[*Photo by C. B. Chadwick.*

It does not occur in numbers every year near Sydney.

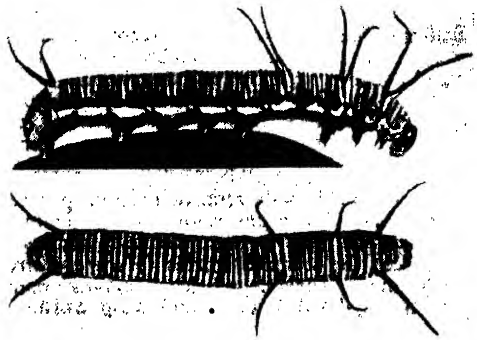
Although most specimens received for identification have been found on oleander (*Nerium*), the caterpillars also feed on a large number of plants which have a milky sap. The plants recorded include native figs (*Ficus* spp.), *Stephanotis, Rhynchospermum, Mandevillea* and others.

The yellowish, spindle-shaped eggs are placed in an upright position on the surface of a leaf. The larva or caterpillar, which measures about 1½ inches in length when fully-fed, is greyish or reddish-brown with several black bands margined with white on the segments, and a lighter band along each side of the body. There are four pairs of long, black, fleshy tenacles on the upper surface.

The pupa or chrysalis, which measures about ¾ inch in length, is attached to some part of the food-plant and hangs head down. The pupae are variable in colour. Some are golden with darker bands and stripes or brown with darker markings. Others are beautiful shining silver and these have attracted considerable attention when hanging on the leaves.

The butterflies, which measure about 3 inches across their outspread wings, are of a general dark-brown colour marked with whitish spots. They have a slow flight.

Control measures, usually, are not necessary, but sprays containing arsenate of lead or D.D.T. could be used if required.

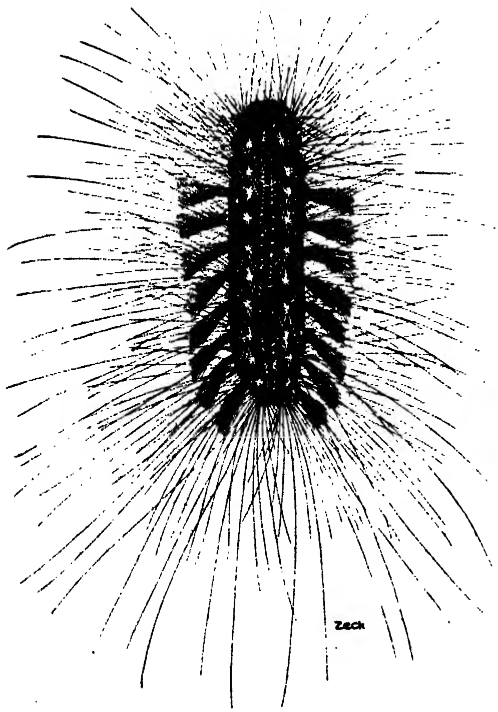


Caterpillar of the Oleander Butterfly (Slightly enlarged).

[*Photo by C. E. Chadwick.*

The Orange-Barred Grass Moth *(Eutane terminalis)*.

FROM time to time various species of insects are recorded invading dwellings in large numbers. During the past month, the small hairy caterpillars of the orange-barred grass moth have been numerous in various suburbs around Sydney and have been found crawling about various rooms in houses and climbing up walls, over furniture and amongst clothing.



Caterpillar of the Orange-barred Grass Moth.

Group of Cocoons and Resting Adult of the Orange-barred Grass Moth.
Actual size.

Orange-barred Grass Moth.

In some instances householders have been concerned, thinking they may be some new

(*Continued on page* 101.)

Sodium Fluoride for the Treatment of Round Worms in Pigs.

SODIUM fluoride and oil of chenopodium are the only reliable drugs available for the removal of the large round worm in pigs. Oil of chenopodium is relatively safe and will, on the average, remove most of the mature worms, but it is costly and involves individual treatments by stomach tube or drenching gun.

Sodium fluoride was first recommended in America, but as it is an irritant poison it was decided not to recommend its use officially in New South Wales until it had been tested under laboratory and field conditions. Some general conclusions based on this work which has extended over the past three years can now be presented.

Sodium fluoride will remove over 90 per cent. of mature and immature round worms from the small intestine, has a high efficiency against at least one of the stomach worms (*Ascarops strongylina*) and a variable efficiency against nodule worm, thorny-headed worm and whip worm.

Method of Administration.

Fluid drenches or wet mash preparations of sodium fluoride may result in death, acute gastroenteritis or retardation of growth.

Given as a powder mixed in a quantity of dry feed equivalent to one day's grain ration per pig, it frequently causes vomiting, but in field trials involving some 200 pigs it did not cause any deaths, and the weight gains to baconer weight of groups which were treated twice with sodium fluoride were comparable with those of similar groups treated with oil of chenopodium and greater than those of untreated infested controls.

The most efficient dose rate is 0.15 grms. per lb. body weight. This is equivalent to 1 oz. for four 50-lb. pigs or eight 25-lb. pigs. Slightly lower dose rates are less efficient and higher dose rates more toxic. Treatment should be preceded by 24 hours starvation. Scouring, pneumonic or very weak pigs should not be given sodium fluoride.

Group treatment is satisfactory and economical provided the powder is evenly mixed in the bulk one day ration, and that there is no great disparity in the weights and stamina of the pigs constituting the group. It is necessary to provide enough troughs or self feeders to allow all pigs equal access to the feed without overcrowding.

Since the drug makes the feed less palatable it is advisable to start treatment early in the morning and to withhold all other feed for 24 hours. If any of the sodium fluoride-treated feed remains the following morning this should be removed.

Pigs are best treated at the age of 10-12 weeks and again about three weeks later. Reinfestation is likely to occur unless they are maintained in uninfested runs or pens.

Owners proposing to undertake treatment with sodium fluoride are advised to consult their nearest Veterinarian or Inspector of Stock.—O. M. MACPHERSON, B.V.Sc., Veterinary Research Officer.

Fruit Growing—*continued from page* 73.

The dried product is then packed into clean boxes for consignment to wholesalers who pack the figs into 1 lb. cartons.

Should the grower desire to pack and market his own product, the following procedure may be adopted:—

First, the fruit must be graded for size and quality. Sizing can be done by passing the fruit over screens with 1¾-inch, 1½-inch, 1⅜-inch and 1⅛-inch holes. Fruit smaller than 1⅛ inches, together with over-dried, damaged and spotted figs, should not be packed. A ready market can usually be found for such fruit in the confectionery trade. Diseased and green fruit should be discarded.

After sizing and grading, the fruit is weighed into 1 lb. lots, flattened between the finger and thumb and packed into moulds for pressing into blocks. When packing into the moulds care should be taken to keep all the stems facing one way. The top layer should only show the eyes of the fruit facing out; this gives a neat attractive pack of uniform appearance. After pressing, the block of fruit is wrapped in cellophane, sealed and labelled. When wrapping, it is usual to have a piece of cardboard of correct size on the bottom of the block. The blocks of fruit are then packed into boxes for marketing.

Observations on the—
BREEDING HABITS OF ROMNEY MARSH EWES
With Special Reference to Hand Service.
POSSIBILITIES OF ONCE-DAILY MATINGS.

◆

R. D. EASTOE, H.D.A., P. B. SUTTON, H.D.A.,* and J. MCDONALD, H.D.A.,†
Livestock Officers (Sheep and Wool).

THE increasing importance of hand service in stud sheep breeding, and the economy which could be effected if once-daily mating should prove practicable, led to the making of a series of observations on the incidence of oestrus at Hawkesbury Agricultural College. These were followed by an experiment in which once-daily mating was contrasted with the usual practice of twice-daily mating. The former method appears likely to be a practicable proposition with the Romney Marsh.

Observations.

Observations have been made on the Romney Marsh flock at Hawkesbury Agricultural College on three occasions: (1) in 1946,* commencing on 29th April, and concurrent with the normal mating programme: (2) in 1947, commencing on 14th April (no matings occurred in this first cycle): and (3), in 1947, commencing on 30th April, with concurrent matings as described in the part of this article dealing with the experiment conducted in 1947.

> *The figures in the accompanying tables (Figs. 1, 2 and 3) are numbers of ewes.*
>
> *Three readings may be taken from the tables—*
>
> *Vertically the hour of commencement of oestrus is shown;*
>
> *Horizontally the hour of cessation; and*
>
> *Diagonally the duration of oestrus in hours.*

The procedure for determining the presence of oestrus was to select in-season ewes by colour spotting, using vasectomised rams ([1]Kelley, 1937). Similar teasers were used to test the presence or cessation of oestrus in selected ewes. Observations were made continuously, day and night, at four-hourly intervals. The method of recording was as follows: Any ewe which was not coloured at 2 a.m., but which was coloured at 6 a.m., was recorded as having

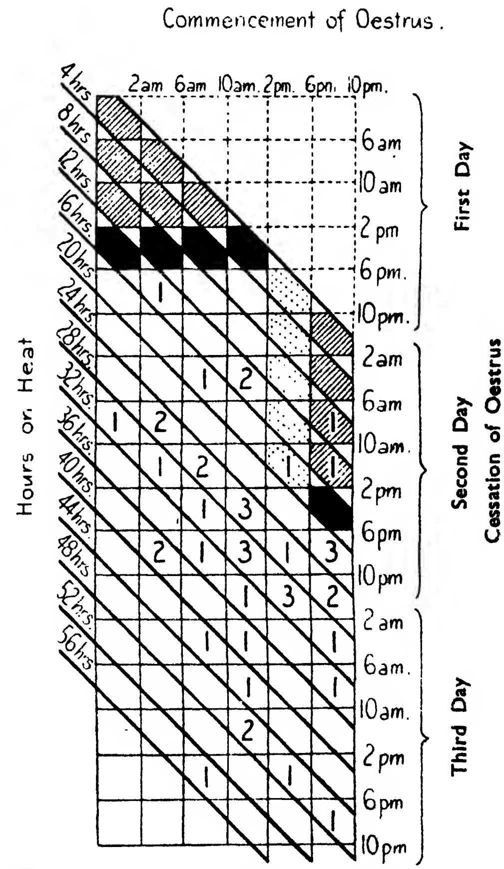


Fig. 1.—Table Showing Hour of Commencement, Hour of Cessation and Duration of Oestrus, Romney Marsh Ewes, 1946.

*Assisted with 1946 observations.
†Assisted with 1947 observations.

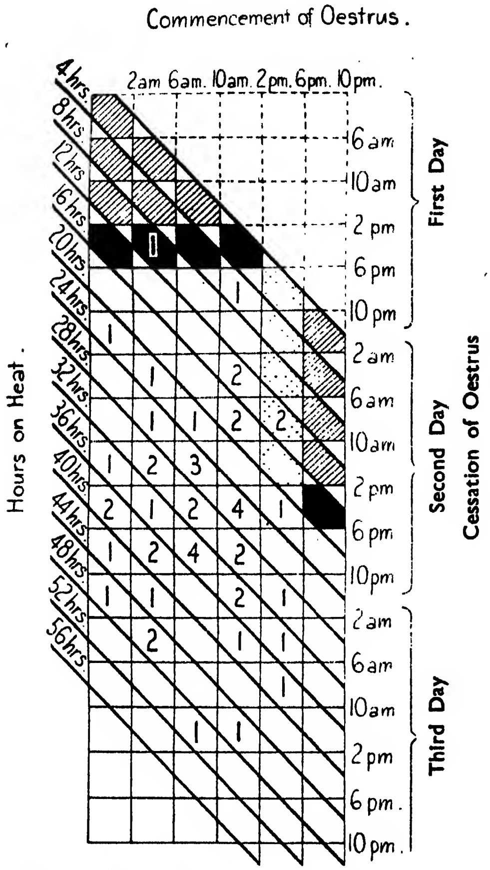


Fig. 2.—Table showing Hour of Commencement, Hour of Cessation and Duration of Oestrus, Romney Marsh Ewes, 1947 (April).

come on at 6 a.m. Similarly, ewes which would accept the teaser at 6 p.m., but would not stand at 10 p.m., were recorded as having gone off at 10 p.m.

Time Factors in Oestrus.

The average period on heat for each of the three sets of observations was:

1946—31 hours 26 minutes (43 ewes);

(April) 1947—31 hours 54 minutes (49 ewes);

(May) 1947—32 hours 5 minutes (49 ewes).

The variations in duration of oestrus of the individual ewes are shown graphically in the histograms (Figs. 4, 5 and 6). Only one ewe in eight had a period on heat of less than 24 hours.

The observations made on duration, the hours of day of commencement and cessation of oestrus have been assembled in tabular form in Figs. 1, 2 and 3. The figures in the body of these tables are numbers of ewes. The vertical columns of the tables show the hour of the day or night at which commencement of oestrus was observed. The horizontal rows of the tables indicate the hour (of the first or second day after commencement) at which cessation of oestrus was observed. The additional oblique ruling in the tables divides the ewes into groups with equal durations of oestrus.

Examination of these tables will show that, in all, over the three sets of observations, 11 ewes were first observed on heat at 2 a.m., 24 at 6 a.m., 29 at 10 a.m., 38 at 2 p.m., 21 at 6 p.m. and 18 at 10 p.m. These ewes therefore came on heat in greatest numbers between 2 a.m. and 2 p.m. (64.5 per cent.), but almost as many commenced oestrus between 6 a.m. and 6 p.m. (62.4 per cent.). It should be mentioned

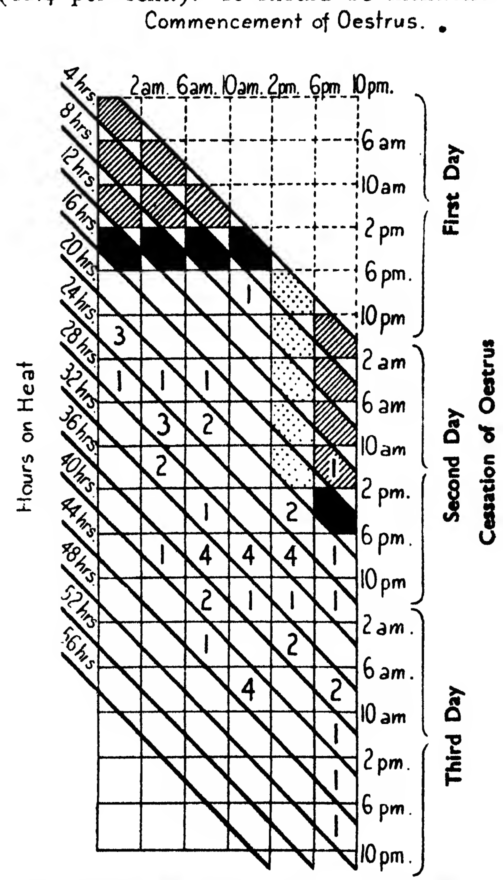


Fig. 3.—Table showing Hour of Commencement, Hour of Cessation and Duration of Oestrus, Romney Marsh Ewes, 1947 (May).

that there appeared to be little association between the times of day in which individual ewes commenced oestrus in successive periods. It may be noted, too, that these results differ from Kelley's (1937) observations[1] in this respect. He found that 67.2 per cent. of his ewes came on at night—between 5 p.m. and 7 a.m.

Cessation of oestrus was distributed as follows over all three sets of observations: 20 ewes went off heat between 10 p.m. and 2 a.m., 19 between 2 a.m. and 6 a.m., 24 between 6 a.m. and 10 a.m., 19 between 10 a.m. and 2 p.m., 21 between 2 p.m. and 6 p.m., and 38 between 6 p.m. and 10 p.m.

It would appear from detailed examination of the tables (Figs. 1, 2 and 3) that almost all ewes could be served by once-daily mating and that any hour in the twenty-four could be considered satisfactory. For example, the situation for service at 5 p.m. is indicated by shading. Any ewes in the hatched zone could not be served. Those in the darkened zone, although they would not stand voluntarily, could be held and served with every chance of conception as they would still be attractive to the ram. All the remaining ewes would stand for service, with the exception of those in the dotted zone, whose service depends on the time they come on between 2 p.m. and 6 p.m. and whether mustering is done prior to or after mating.

Other observations may be mentioned which are of interest. In 1946, three out of forty-four ewes showed an aberrant period during oestrus, in one case for four hours, and in the other two cases for eight hours. Before and after this period, the desire during oestrus was quite normal. No cases of this kind were noted in 1947.

Further observations suggest that loss of condition or other upsetting factors shorten the period the ewe is actually on heat. At an inspection of ewes after mating, seven showed signs of loss of condition, or displayed poor constitution. All these ewes showed erratic figures in varying degrees in their oestrual records. Certain ewes which picked up in condition between the first and second onsets (1947) showed a greater duration during the second than the first onset. Other ewes which lost condition showed the reverse.

From a practical viewpoint all ewes came in season within 17 days in each of the three sets of observations reported (c.f. Annual Rept., C.S.I.R. 1945). Only one dioestrus period was observed (1947), but the figures, which closely approximate Kelley's (1937)[1] findings, were:—

14-16 days, 10 per cent. of ewes;

16-17 days, 68 per cent. of ewes;

17-18 days, 22 per cent. of ewes.

Daily Matings would be Practicable.

Returning now specifically to the likelihood of success with once-daily matings, it has to be mentioned that there is a further

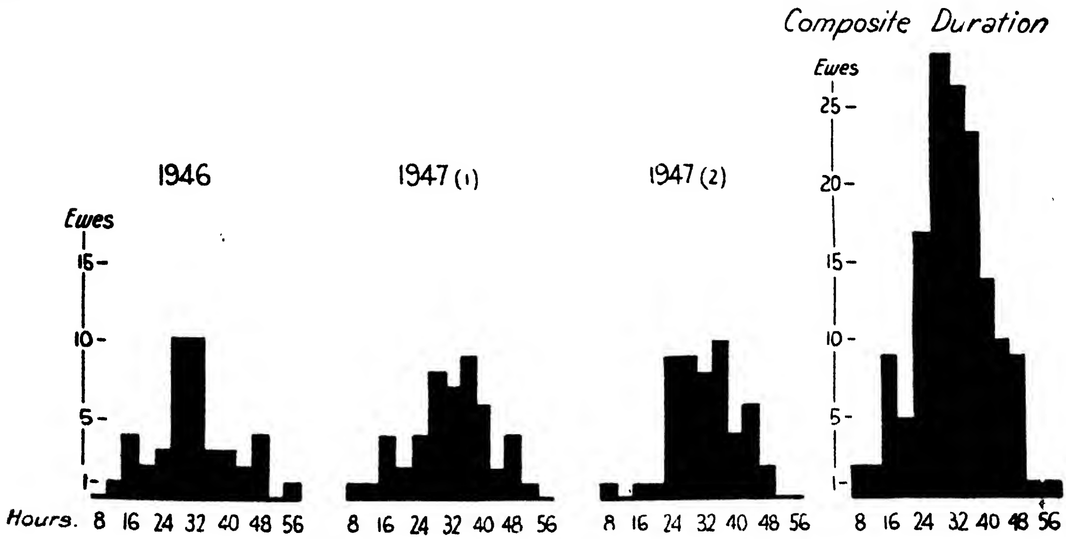


Fig. 4.—Histogram showing Duration of Oestrus, Romney Marsh Ewes.

factor to be taken into consideration, namely the optimum stage during oestrus for insemination. Kelley (1937)[1], working with Merinos and Dorset Horns, estimated that the ovarian follicle ruptures immediately after cessation of oestrus. He assumed that fertilisation occurs in the upper part of the fallopian tubes and found that spermatozoa reach this area in about 5 hours.

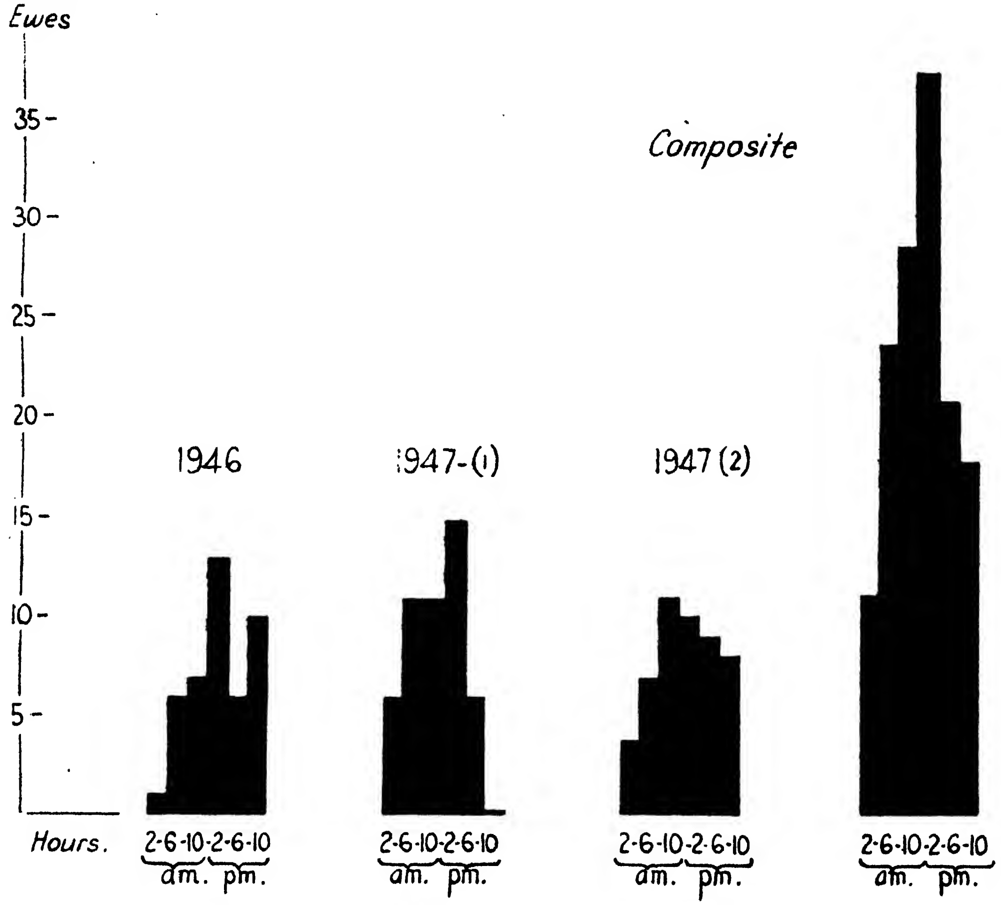


Fig. 5.—Histogram showing Time of Commencement of Oestrus in Romney Marsh Ewes.

He, therefore, places the optimum time for insemination at 5 hours before cessation of oestrus, but recognises that the length of life of spermatozoa must also be taken into consideration. That the duration of the fertilising power of spermatozoa could be in excess of 24 hours is shown by the work of Quinlan (1932-33)[2,3], Kelley (1937)[1], and Lopoyrin and Loginova (1939)[4].

Examination of the upper part of the fallopian tubes of six Romney Marsh ewes 24 hours after service by one or other of two rams at Hawkesbury Agricultural College in 1947 disclosed appreciable numbers of spermatozoa of healthy appearance in all cases.

In view of the likelihood of success of once-daily mating to be inferred from the above observations, it was decided to conduct an experiment to discover whether this method would work out in practice.

Experiment Procedure.

The present practice in hand-service is to mate twice daily (Kelley 1937[1], Eastoe 1945[5]), and the aim of the experiment was to determine whether or not once-daily service would prove equally satisfactory.

To obtain a representative sample 49 Romney Marsh ewes were normally classed into two sire groups and the ewes to each sire were further divided into maidens and bred ewes. From the four groups so obtained, selections were made at random.

Half the ewes from each group were placed into the 12-hourly (or twice daily) experimental mating group and the other half into the 24-hourly (or once daily) experimental mating group. In addition to recording ear-tag numbers, ewes were marked with paint (Eastoe 1945[6]) to indicate their sire group and whether they were to be mated once or twice daily.

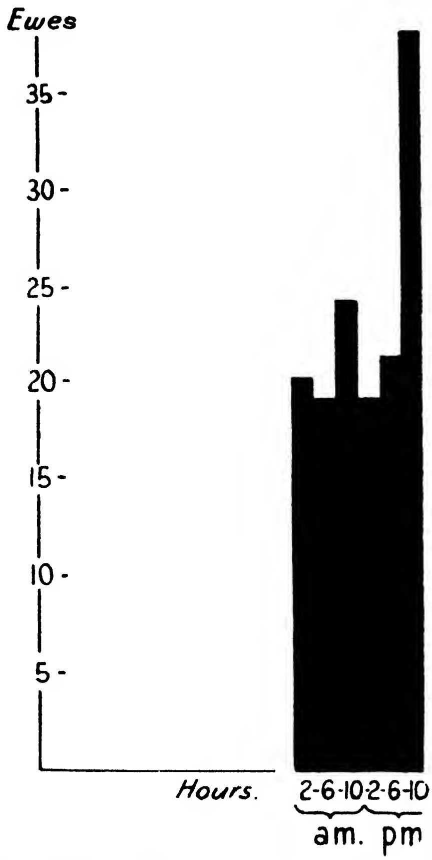


Fig. 6.—Histogram showing Composite Time of Cessation of Oestrus in Romney Marsh Ewes.

Whilst oestrus persisted, 12-hourly group ewes were mated at 6 a.m. and 5 p.m., which is normal practice, and the 24-hourly group at 5 p.m. only. All ewes were run together in one paddock with raddled vasectomised teasers to select the ewes on heat (Kelley 1937[1]). All came in for service within seventeen days, but teasers were left in for a further equivalent period to mark any ewes which returned. Six ewes only returned (12 per cent.). These were equally divided between the 12-hour and 24-hour groups, four coming back to the old ram and two to the younger ram. These were served on return according to their grouping and all these six ewes subsequently lambed successfully.

All ewes were run together during gestation and were grazed both on natural and improved pasture. The plane of nutrition was maintained at a satisfactory level. One drenching with phenothiazine was given in the early stages of pregnancy. Two ewes died during pregnancy; conception was confirmed by post-mortem examination. For all other ewes, the conception recorded is based on actual lambing.

Successful Conceptions.

The results obtained are given in the following table, which shows the actual number of ewes in each experimental group which did and did not conceive. It will be seen that there was a difference in conception of 5.9 per cent. in favour of the twice-daily, in comparison with once-daily mating. The difference is statistically non-significant, but may be real, and further experimental work will be necessary to determine its magnitude.

		Conceived	Failed	Total Mated	Conception Percentage
Group I—12-hourly mating					per cent.
	Sire 277 of '43	10	1	11	...
	Sire 292 of '44	13	2	15	...
	Total . .	23	3	26	88·5
Group II—24-hourly mating	Sire 277 of '43	8	3	11	...
	Sire 292 of '44	11	1	12	...
	Total . . .	19	4	23	82·6

The seven ewes which did not lamb, failed to return for re-service. There were three in the 12-hourly group and four in the 24-hourly group. From subsequent examination of the breeding cards, it would appear that two of the four ewes which failed to conceive in the 24-hourly group are barren.

The average gestation period of the ewes which lambed in this experiment was 147.9 days, with a range from 135 to 155 days. Thirty ewes (75 per cent.) lambed within the range of 146 to 150 days, whilst five ewes (12½ per cent.) were above and five ewes (12½ per cent.) were below this

range (c.f. Kelley 1937,[1] Daley and Eastoe 1943[6]).

Summary.

Two groups of Romney Marsh ewes, the one (26 ewes) mated twice daily, the other (23 ewes) mated once daily, showed but little difference in conception percentage (88 and 83 per cent. respectively).

Once-a-day mating greatly reduces the time and labour involved in mustering of raddled ewes in comparison with twice-a-day mating. Afternoon appears to be the most satisfactory time for 24-hourly mating.

The duration of oestrus is sufficiently long to permit of once-daily matings, but ewes with very short periods may require special attention.

Ewes kept on a satisfactory and even plane of nutrition display more regularity in their oestrual periods than those affected by variable diet and/or other upsetting factors.

The fallopian tubes of slaughtered ewes were found to contain spermatozoa of healthy appearance 24 hours after coitus.

The average gestation period of the 40 ewes which lambed in this experiment was 147.9 days, slightly less than the accepted period of 150 days.

Acknowledgments.

The assistance of Messrs. Christie, Doman and Waring, of Hawkesbury Agricultural College staff, Mr. Sapsford, of the Veterinary School, University of Sydney, and also of certain College students, is gratefully acknowledged.

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[5] Eastoe, R. D., "Hand Service of Stud Sheep," N.S.W. Agr. Gaz., Feb., 1945.

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Benzene Hexachloride (B.H.C.) for Prevention of Body Strike in Sheep.

THE abnormal, showery weather and relatively low temperatures during the past two months have rendered sheep particularly susceptible to blowflies. During this period body strike has been very severe. In the Upper Hunter Valley, where the fly has been very troublesome, up to 50 per cent. of young sheep have been affected with body strike. In order to combat the blowfly in this district young sheep have been and are being shorn six months, and less, off shears. The blowfly has been so severe that a heavy incidence of body strike has even occurred in freshly-shorn sheep.

An Experiment at Scone.

Since preliminary work with B.H.C. has shown that this chemical has merit as a preventive of poll strike in rams and as a blowfly dressing, an experiment was arranged on Mr. F. C. Kater's property, Grampian Hills, Bunnan, near Scone, to determine its value as a preventive of body strike in sheep. The trial was commenced on 30th December, 1947.

In this experiment two groups of sheep, each containing 100 July-shorn ewes, eighteen months old, were treated with a dispersion of B.H.C.

One group was treated in a spray dip, in which the bottom and top sprays worked simultaneously, with a dispersion of B.H.C. at an initial concentration of 0.5 per cent. The sheep were treated in two pens and were sprayed for three periods, of 2 minutes each, with a minute interval between spraying. The fleece was not completely wetted, although 1.3 gallons of dispersion were removed per sheep.

In the other group the sheep were jetted over the shoulders and along the back with 0.32 per cent. B.H.C. at rate of four sheep per gallon. The jetting was conducted with a three-jet nozzle at 60 lb. pressure per square inch, and a satisfactory wetting of the wool was obtained.

The two treated groups were run with approximately 700 untreated ewes. During the subsequent three weeks the fly was very active, and 19 per cent. of body strike occurred in the untreated sheep. In the group which had been jetted over the shoulders and down the back, four sheep were struck but three of these strikes occurred away from the jetted area. No strikes occurred during this period in the sheep which had been treated in the spray dip.

If favourable conditions for body strike persist, young sheep could be advantageously treated with B.H.C. with either of the methods used in this experiment.

The writer is grateful to Mr. F. C. Kater, of Bunnan, for making the sheep available for the trial and to Messrs. William Cooper and Nephews Pty. Ltd. for supplying the preparation for the investigation—G. J. SHANAHAN, Assistant Entomologist.

Part of Hawkesbury College Apiary.

APIARY NOTES

THE PRODUCTION AND TREATMENT OF HONEY.*

W. A. GOODACRE, Special Livestock Officer (Bees).

IN the production and treatment of honey, the bees themselves have the first and most important part to play, and being specially endowed by nature to carry out the work they can be depended upon to do it to perfection.

Then the human comes into the picture, and if this delicious natural food is to be brought to the table without deterioration, the bee-farmer, the packer, and finally the housewife must give it the care and attention it deserves.

Nectar is Not Honey.

The general impression that bees gather honey from flowers is not strictly correct. Actually, they gather nectar, a dilute saccharine liquid, which is the raw material from which the bees—the chemists of the hive, as we may term them—make the honey.

A worker bee has a special sac in her body to hold the nectar as it is gathered and many flowers may be visited before a full load is secured. On the way home the field bees make some small contribution towards the changing of the nectar into honey. On arrival home the supply is transferred to house bees (young workers) who further the process of inverting the simple sugar of nectar into honey before it is placed in the honey-comb cells in the hive.

*Notes of a recent broadcast address.

Processing in the Hive.

Even at this stage, the honey is rather dilute, and further moisture must be evaporated from it by the bees fanning with their wings to force a current of air over the surface of the partially filled combs.

Thus, during a honey flow, there is great activity until the combs in the hive are full of honey properly balanced in its sugar contents of dextrose, levulose and sucrose, the keeping qualities of the honey being ensured by the high concentration of these important sugars in relation to the moisture content.

Honey is not entirely made up of the sugars mentioned, as it is known also to contain enzymes and mineral matter important to the health of humans.

On completion of the process of transforming the nectar into honey, the honey stored in the combs is capped over with a thin film of wax, beautifully patterned over each individual cell. Framed combs on display at the Royal or country shows never fail to attract attention.

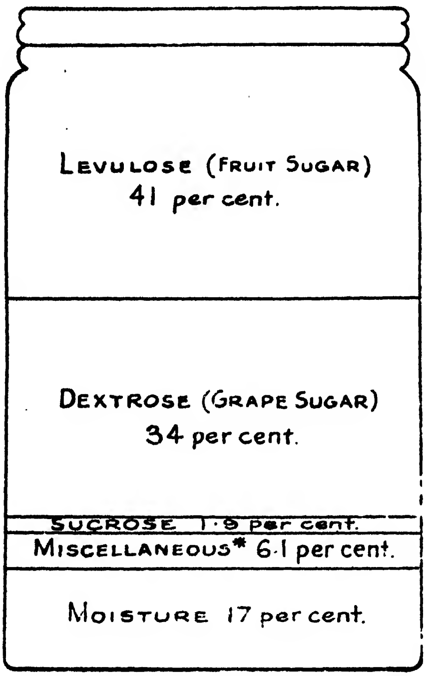


Diagram showing Principal Components of Honey.

* Miscellaneous includes dextrin, protein, ash and unknown substances.

To the bee-farmer, the capping of the combs by the bees denotes that the honey is ready for extraction. The number of full combs the apiarist will remove from the hives for extraction will depend on whether the honey flow is likely to continue, or whether the winter period is approaching and a more than usual quantity of stores must be left with the colonies. The capacity of populous colonies of bees to store honey above their own requirements during a honey flow is remarkable; an average storage of 60 lb. per hive every two weeks whilst the flow lasts is quite usual in well managed apiaries.

Extraction Work.

To proceed with the extracting work, the bee-farmer removes the full combs from the hives, any adhering bees being shaken in front of the hive entrance where provision is made for them to crawl up from the ground into the hive. The use of a brush is necessary at times to dislodge some bees which persist in hanging to the combs. When a barrow or yard trolley load of full combs is secured, it is taken to the honey house for extraction of the honey.

In extraction, the capping over the honey is first cut off with a special type of knife kept heated in hot water or by steam forced through a steam jacketed portion of the blade. The cut-off cappings, which also contain some honey, fall into a cappings reducer which is also kept heated with hot water or steam. This reducer saves the bee-farmer a good deal of work as, in addidition to melting the wax from the cappings, it also separates the honey from the melted wax.

The uncapped combs of honey are now ready for placing in the honey extractor. In the body of this machine, a number of baskets for holding the combs are attached to a mechanism which can be revolved at the required speed. When the extractor is in action, the honey is removed from the uncapped combs by centrifugal force and the combs are not damaged to any extent during the process.

As the extracting work proceeds, the honey from the extractor is either gravitated or pumped into honey tanks, after passing through a fine mesh strainer. The honey is allowed to remain in the tanks to settle properly, and is then drained off into 60 lb. honey tins or drums, which are used for bulk storage on the farm. In large apiaries a special heating apparatus is employed to expedite the straining and settling of honey. This heating reduces the viscosity of the honey.

Causes of Deterioration.

If the beekeeper follows a sound technique in carrying out his part of the work, there is no reason why the honey finally tinned off into bulk containers should not contain all the special qualities of this valuable food.

However, if the honey is extracted before the combs are reasonably well capped by

the bees, the sugars in it may not be properly balanced, and the moisture content may be higher than desired. This will result in some deterioration of the natural flavour and aroma and possibly in interference with the keeping qualities of the honey. Then again, honey must not be overheated as its natural colour will be affected, and the enzyme invertase may be destroyed. For straining and clarification of honey, the temperature should not exceed 100 deg. Fahr. These are important points that should be kept in mind by the bee-farmer.

Blending Honey.

Honeys of a variety of flavours and colours are produced from different species of flora, and rather than put out the various types in separate lines, wholesale packers of honey prefer to make up standard blends. This blending work requires careful attention to selection of the honey to be used. The packer must, of course, avoid overheating.

Candied Honey.

Candied honey has become popular for table use in recent years. The candying of honey is a natural process of crystallisation, and most types of liquid honey can be made to candy very quickly if given a start by stirring into them 5 to 10 per cent. of candied honey. To facilitate the mixing and ensure dispersion of this starter, the temperature of the liquid honey should be about 75 degrees. A good stirring is necessary, and afterwards the honey should be moved to a cool place; a temperature of about 57 degrees is the best. The cool months of the year are the best for making candied honey, as its texture does not hold well under warm conditions.

To make special lines of candied honey, the candy starter must be a selected, whitish, fine-grained type, and selection of the liquid honey for its flavour and candying characteristics is also desirable. The stirring of any candied honey will cause it to whiten in colour and make the grain fine. This could be tested in a small way in the home should the honey on hand candy naturally; all that is necessary is to beat it up like a cake mixture in a mixing bowl. Only small quantities should be processed at a time as needed for the table.

When it is desired to liquify candied honey in the home the jar should be stood in a saucepan of water kept hot, but not boiling, until the crystals melt.

Honey, liquid or candied, if exposed, will absorb moisture from the atmosphere, particularly during damp weather. In the home, therefore, the jar of honey must be kept properly sealed. During warm weather honey for the table is much nicer if kept in the ice-chest or refrigerator; under cool conditions the honey is denser and more appetising.

Insect Pests—*continued from page* 91.

household pest that would attack clothing, carpets or other materials; but these fears are needless as these caterpillars feed on growing vegetation. They only enter buildings when wandering about seeking a place in which to spin their cocoons.

The larva or caterpillar, which may measure up to ½ inch in length, is of a greyish-brown colour, and covered with groups of long hairs. In addition it bears along the sides of its body, short tufts or "brushes" of hairs.

The caterpillar feeds on grasses and low herbage, and when fully-fed spins a loose, light-brown, silken cocoon into which it weaves the long hairs from its body. The cocoons are irregularly oval in outline and are frequently found grouped together.

The pupa or chrysalis, which measures slightly less than ½ inch in length, is reddish-brown in colour.

The adult, which is somewhat variable in size, is a small moth that usually measures slightly less than 1 inch across its outspread wings. The forewings are black with irregular orange markings across them, and the hindwings are black and orange. The body, also, is black and orange.

The known range of this moth extends from the neighbourhood of Sydney northwards to Maryborough in Queensland. It is a nightflier and is attracted to lights.

Pullorum Disease.

A Major Cause of Mortality in Chickens, Ducklings and Turkey Poults.

D. G. CHRISTIE, B.V.Sc., H.D.A., Veterinary Officer.

IT is generally agreed that this disease is responsible for heavier losses in young chickens than any other single cause. Some poultry farmers declare that with chickens of certain breeds, brooding is reduced to a gamble unless a prior test of the adult stock has been made and carrier birds removed.

This disease was first recognised as an entity about the beginning of the century in America, where it caused high mortality in outbreaks in hen-hatched chicks. When incubators became popular and bigger numbers of chickens were hatched, the disease came into greater prominence. The mass production methods of the present day, involving the use of large capacity air-agitated incubators and intensive brooding equipment, by virtue of the facility with which they can effect the spread of the disease, demand that measures to control pullorum disease be given No. 1 priority.

The Cause.

Pullorum disease is caused by a microscopic germ called *Salmonella pullorum*. This germ can live only a few days on a dry surface exposed to sunlight. However, in sheds and in moist situations it will survive for long periods. It will persist in dirty brooding equipment from one season to the next. In one experiment the germ was still alive after four and half years in a piece of dry cloth kept indoors.

Susceptible Birds.

All breeds of fowls are susceptible, but it is observed that the light breeds (Mediterranean), particularly the White Leghorn, show a greater tolerance to the disease than the heavy breeds, so that while a 30 per cent. mortality may be experienced in White Leghorns, a 90 per cent. mortality is not an uncommon occurrence in the heavy breeds.

Numerous outbreaks have occurred in ducklings and young turkeys. In turkeys the disease has assumed greater importance with the introduction of mass incubation and brooding methods.

Other birds which have suffered from the disease are:—Pheasants, guinea fowls, quail, bullfinches, and sparrows. The possibility of carrier wild birds causing a breakdown in clean flocks should not be disregarded.

Chickens Affected with Pullorum Disease.

Most Susceptible Age.

Chickens from day old to three weeks old are most prone to the condition. If infection occurs after three weeks mortality is generally low and most chickens recover, to develop into adult carriers of the germ.

Immune Strains.

Quite apart from the difference in susceptibility between breeds, it has been demonstrated that certain strains of fowls within breeds show a stronger than normal resistance to pullorum disease. The breeding of such resistant strains may be a feature of the control of this diease in the future.

Predisposing Causes.

While pullorum disease cannot occur without the presence of the germ, any factors which cause a lowering of the birds' resistance may lead to greatly increased losses if operating with the disease.

Bad brooding equipment and faulty management are two important predisposing causes. Chilling of chicks results from insufficient heat which causes the chicks to crowd and then suffocate. Another serious error is overcrowding. Again, some neglect the brooder house temperature and concentrate on the brooder temperature, forgetting that the temperature of the brooder house environment is nearly as important as that in the brooder. It should be more widely realised that within reason and providing chicks can move away from its source, it is practically impossible to provide too much heat in the brooder; the comfort of the chickens and not the actual temperature should be the guide. When brooder temperatures were increased from 5 to 10 degrees above normal levels in the case of batches of chickens infected with pullorum disease, the losses were significantly reduced in comparison with similar infected batches brooded at normal temperatures. This "artificial fever" treatment has proved helpful in dealing with outbreaks of the disease.

The Cycle of Infection.

Reference to the diagram will indicate the definite cycle of infection which applies in this disease. In an outbreak some affected chickens recover but still harbour the germ in the ovary. On reaching adult stage these carrier birds come into lay and a proportion of their eggs (one figure stated is 33.7 per cent.) are infected with the germ. Fortunately most of these eggs fail to hatch.

When an infected egg does hatch the fluff (carrying the germ) from the newly-hatched chicken dries, floats through the hatching chamber and is inhaled by other chickens, setting up infection in their lungs. Such infected chickens may die within the next two to five days, but prior to death pass the germ in their droppings, so enabling spread of the disease to other chickens which pick up the germ in feed or water. The cycle of infection is continued by those chickens which recover from the disease and become carriers.

The disease can be spread from one adult bird to another by infected droppings, cannibalism of infected birds, egg eating, egg picking, and even by flies. While the rate of spread is slow it is seen to be of the greatest importance when an endeavour is made to eradicate the disease from a flock.

A high percentage of infertile incubator eggs from an infected flock contain the germ, and when fed to healthy hens set up the disease, the hens becoming carriers. A number of farmers have been "caught" by this practice of feeding infertile eggs to hens.

Infection has been transmitted to chickens from carrier hens by direct or indirect contact and severe outbreaks have occured in this manner. Indirect contact may include the carrying of infection from adult yards to the brooder runs on boots.

Appearance of the Disease.

While a whole range of symptoms can be described for this disease, in some outbreaks the owner finds chickens dead without very much evidence of previous sickness.

Affected chickens may appear chilled and huddle together, even though the brooder temperature is normal. They refuse food, show laboured breathing and chirp persistently. A white diarrhoea with brown in it may be noticed; it is sticky and may cause a pasting of the vent.

Infected adults do not generally show symptoms, but occasionally the disease assumes a septicaemic (blood poisoning) form and affected birds are listless, show a diarrhoea and die. Because the occurrence

of this form in adults is unusual, veterinary advice should be sought if there is any doubt.

Features of an Outbreak.

Typically losses commence on about the second day after hatching, where infection has been picked up in the incubator. Chickens infected by the droppings of such incubator-infected chickens and chickens placed in infected brooders, commence to die on the fourth to sixth day.

The mortality rate reaches its peak on the tenth to twelfth day and then declines, deaths ceasing somewhere between the twentieth and twenty-eighth day. In the case of turkeys the peak is reached rather earlier than the twelfth day.

Losses from the Disease.

In severe outbreaks the mortality rate may vary from 70 to 90 per cent. in the case of heavy breeds; 20 to 40 per cent. in White Leghorns; 30 to 50 per cent. in ducks, and in turkey poults infected in the incubator an average mortality percentage of 34.5 was experienced in thirty-two outbreaks involving 20,000 poults in America.

Unfortunately losses are not restricted to a mortality in chickens. Other avenues of loss in this disease are decreased hatchability of eggs, stunting of carrier chickens, odd mortality of adult birds and lowered egg production of carrier adults.

Post-Mortem Appearances.

In Chickens.—A careful examination is required to detect abnormalities characteristic of the disease. At least six chickens should be "post-mortemed", as fewer may not show sufficient features to establish a diagnosis beyond doubt, and there is the further possibility that another disease condition may be operating at the same time.

The following changes will be observed, although not all may be seen in any one chicken, and because the germ is in the blood stream, lesions may appear in any portion of the body, while evidence of blood poisoning will be noted.

The lungs will be congested (dark or livid) and may show yellowish-green to grey

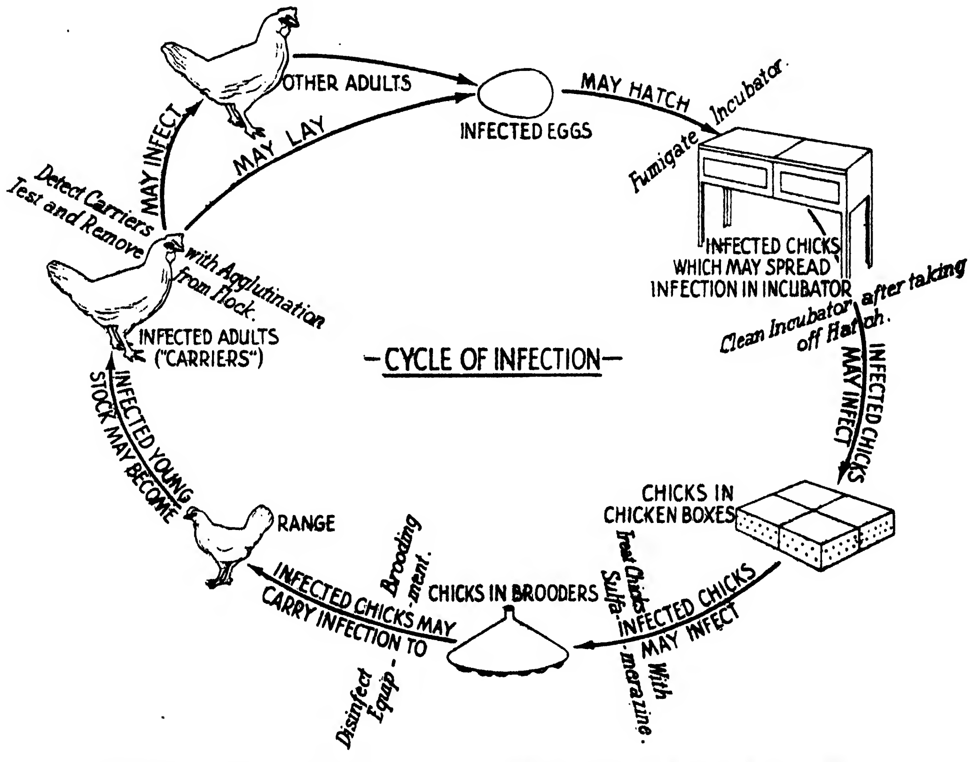
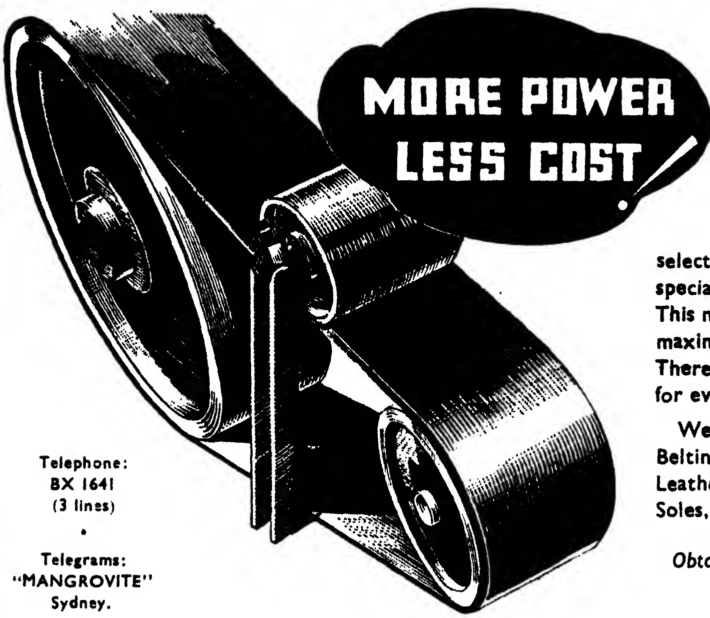


Diagram showing Cycle of Infection of Pullorum Disease and Control Measures Recommended.
[Adapted from Biester and Devries.


DEPARTMENT OF LABOUR
COMMONWEALTH EMPLOYMENT SERVICE
AND NATIONAL SERVICE


MORE POWER
LESS COST

areas, varying from a pin's head to a wheat grain in size. Lung changes are more prominent when infection has occurred in the incubator.

The intestine, particularly the first part, may be inflamed and a fairly constant finding is the presence of a cheesy plug or core in the two blind guts or caeca.

Small yellow areas may be seen in the heart wall, in the liver and sometimes in the spleen. The liver is sometimes mottled and presents a cedar appearance which differs from the typical light-yellow ochre-coloured liver of the newly-hatched chicken. In chickens over ten days old there is frequently an abnormal retention of the yolk.

In Adults.—When the septicaemic (blood poisoning) form of the disease appears in adults, post-mortem examination will generally show a much enlarged and discoloured liver, together with enlargement of the spleen, inflammation of the heart sac (pericarditis) and misshapen yolks (ova) on long stalks in the ovary. Carrier birds will show changes only in the ovary and the characteristic misshapen yolks are noted.

Diagnosis.

An accurate diagnosis is established by the recovery of the germ (*Salmonella pullorum*) from chickens which have died from the disease. This work is carried out in the laboratory and places the issue beyond all doubt. It is therefore suggested that owners take affected chickens to a veterinarian.

Carrier adult birds are detected by means of the agglutination test. The rapid whole blood agglutination test can be carried out on the farm (see separate departmental leaflet), and while no biological test is 100 per cent. accurate, this is quite satisfactory for all practical purposes.

Differential Diagnosis.

Pullorum disease may be confused with any one of the following:—

Brooder Troubles.—Overcrowding and chilling of chickens will cause serious mortality. Chickens huddle together and death is caused by suffocation. On post-mortem examination the lungs are found to be very congested. Wet, unhygienic brooders will cause loss. As mentioned previously, the maintenance of adequate heat is of paramount importance, and the brooder house temperature should be kept as constant as possible by insulating the building with bag curtains or by lining it.

Omphalitis is essentially an inflammation of the navel and losses generally cease about seven days after hatching.

Coccidiosis and Blackhead.—These conditions generally make their appearance in chickens from three weeks of age onwards, but outbreaks have been seen as early as the seventh day. Blood is observed in the droppings and the small intestine and caeca (blind guts) are inflamed.

Brooder Pneumonia (Aspergillosis).—A not very common condition. It is caused by a fungus which affects the lungs and air sacs particularly. The fungus is picked up from mouldy food or from surroundings when conditions are wet and unhygienic.

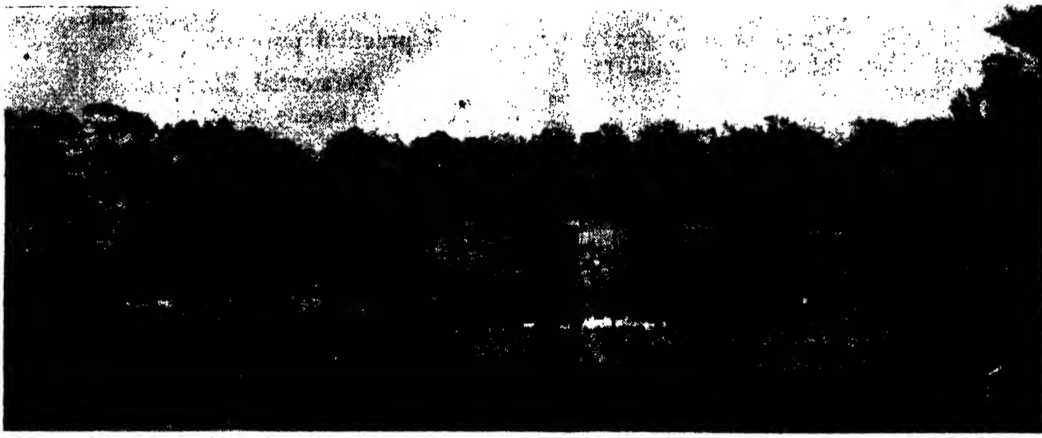
Sexing Injuries.—Death occurs at once or within two days of sexing, and chickens show a ruptured abdominal wall or ruptured blood vessels in the liver or lung on post-mortem examination.

(To be concluded.)

IT is quite a mistake to think that the damage sustained by land as the result of a bush fire is only superficial, points out a pamphlet issued by the New South Wales Bush Fires Advisory Committee.

"The thoughtless are inclined to assume that the effects of fire soon pass away. Rain comes and quickly there is a green shoot in the grass and all seems well. This is far from being the case, as often such plants as come are only of a transient nature. The grass on which the landowner relies—the perennial grasses—are often entirely destroyed, and it may be years before good stock-carrying grass has become established again. The fierce fire running over the surface of the soil burns out of it all the organic matter which helps the land to absorb and retain moisture. Grass and other surface covering such as small shrubs provide protection against winds and heavy run-off of water and save the soil, and shelter more delicate grasses. Destruction of this sheltering cover lessens the productivity of the land.

"Prevention of fires requires the utmost co-operation of all sections of the community and, in addition, individual effort on the part of each landowner.



Poultry Notes.

E. HADLINGTON, Principal Livestock Officer (Poultry).

GROWING GREEN FEED CROPS.

FOLLOWING good early summer rains, those who wish to grow additional areas of green feed for autumn and winter requirements should undertake the early preparation of land. In many cases, cultivation is left until the time for planting arrives, and consequently the ground is not in a suitable condition to ensure the proper establishment of the crop. This applies particularly to land which has been overgrown with grass or weeds, and in such cases it is essential that the ground be cultivated a number of times before the crop is sown. When the ground is not thoroughly clean weeds and grass come up with the crop and choke it before it becomes established.

Lucerne and Berseem Clover.

It is preferable to concentrate on two or three crops which will provide a supply throughout the year. For this purpose the best crops are lucerne and Berseem clover, with, perhaps, rape or barley if facilities are available for planting at the right time. The Berseem clover grows readily during the cold months when the lucerne is at a standstill. An added advantage is that both crops can be treated by the same cultural methods, which simplifies the work of providing a green feed supply.

In both cases the seed should be sown in drills 18 inches to 2 feet apart, so as to allow for cultivation and manuring between the rows; it should be sown to a depth of ½ inch and covered with fine soil. It is essential that a watering system be installed to ensure growth during dry spells.

Where these two crops are being grown, it is best to have an area of lucerne about twice that of Berseem clover, as the Berseem clover grows much more quickly. It must, of course, be understood that Berseem clover is only an annual, but will provide good cutting up to September or October, according to the weather conditions, whereas lucerne will last for about seven years or more if given the necessary attention.

For Best Results with Lucerne.

Of the various crops which can be used for green feed, lucerne is the most satisfactory owing to the fact that, if kept properly cultivated, manured and watered, cuttings may be made throughout the year, with the exception of the coldest winter months, when the crop is more or less dormant. Lucerne can be grown on almost any land in the County of Cumberland, provided that a permanent water supply is available and poultry or other suitable manure is applied in a proper manner. Good crops can be grown under these conditions, even on poor, sandy soil.

Prior to planting lucerne it is advisable to fallow the land, and where this is done it is only necessary to plough to a depth of about 4 inches prior to sowing. After this ploughing the ground should be thoroughly harrowed and rolled to break it to a fine tilth. In the case of heavy soils a further harrowing is advisable after the rolling to prevent caking after rains.

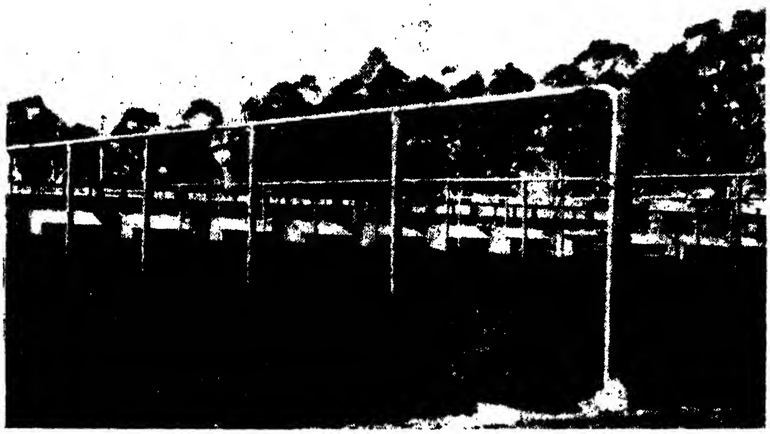
By sowing lucerne in drills it is possible to cultivate between the rows and apply frequent dressings of poultry manure, which should be allowed to rot before being dug in. Fresh manure should not be applied too close to the roots, as it may cause injury and kill off some of the plants.

For the coastal districts, Hunter River and Tamworth varieties of lucerne are most suitable. Only the best seed obtainable should be secured, and care should be taken that the seed is free from weed seeds. About 10 to 12 lb. of seed per acre will usually be found sufficient for planting as described. Better results will be obtained by inoculating the seed before sowing, especially in new ground. The culture for treating the seed can be obtained from the Chief Biologist of the Department of Agriculture at a nominal cost. Directions for use are supplied with the culture.

A Cropping Programme.

The following table shows the crops which may be planted each month for the maintenance of a supply of green feed throughout the year:—

Month.	Crop.
January ...	Maize, cowpeas.
February ...	Maize, barley, rape, field peas, kale, silver beet, Berseem clover.
March ...	Lucerne, wheat, oats, rape, barley, field peas, kale, silver beet, Berseem clover, Chinese cabbage, (Wong Bok).
April ...	Lucerne, oats, barley, field peas, kale, red clover, silver beet, Chinese cabbage, (Wong Bok).
May ...	Lucerne, clovers, oats, barley, silver beet, rye.
June ...	....
July ...	....
August ...	Silver beet.
September	Hungarian millet, Japanese millet, maize, lucerne.
October ...	Cowpeas, maize, Hungarian millet, Japanese millet, lucerne.
November	Cowpeas, maize, Hungarian millet, Japanese millet.
December...	Cowpeas, maize.



Poultry Green Manure Crops.
Irrigated by overhead system.

Crops sown according to the above table would provide fodder for poultry in the following months:—

Month.	Feed Available.
January ...	Lucerne, cowpeas, maize, silver beet.
February ...	Lucerne, cowpeas, maize, silver beet.
March ...	Lucerne, cowpeas, maize, silver beet.
April ...	Lucerne and clovers, wheat, oats, cowpeas, silver beet, barley, rape, maize.
May ...	Lucerne and clovers, cowpeas, silver beet, barley, rape, kale, Berseem clover.
June ...	Wheat, oats, barley, rape, field peas, kale, Berseem clover, Chinese cabbage.
July ...	Wheat, oats, barley, rape, field peas, kale, Berseem clover, Chinese cabbage, rye.
August ...	Wheat, oats, barley, rape, kale, field peas, rye, Berseem clover, Chinese cabbage.
September	Clovers, oats, barley, field peas, rye, Berseem clover.
October ...	Lucerne and clovers, field peas, silver beet, rye.
November	Lucerne and clovers, maize, Hungarian millet, Japanese millet.
December...	Lucerne, maize, Hungarian millet, Japanese millet and clovers.

In the case of lucerne, clovers, rye, rape, kale, and silver beet, repeated cuttings may be made; these are allowed for in the table.

The availability of these feeds as shown is to some extent contingent on rainfall or a good water supply.

It is a mistake to attempt to grow a larger area of green feed than can be properly attended to, as this results in the crops being neglected and becoming overgrown with weeds. A small area which can be watered with an overhead spray and which may be given the necessary attention in the way of cultivation and manuring will provide more green feed than a much larger area which is neglected.

Preparing Birds for Show.

WITH the resumption of a normal programme of poultry shows, a good deal of interest is being shown both by commercial poultry farmers and fanciers in exhibiting at these fixtures, and advice is sought by some intending exhibitors on the method of preparing birds for exhibition. In order to assist those who have had no previous experience in preparing birds, a few hints on the general routine will be helpful.

The mistake should not be made of leaving the selection of birds until a few days before the show, as they mostly lose condition during the first week or so of penning. Thus it is necessary to extend the preparation period over about five or six weeks, particularly for male birds, which must be trained to handle in the coops if they are to show to advantage.

A number of coops of a convenient size are necessary, and these should be not less than about 2 feet square by about 2 feet 6 inches in height. In penning the birds, it is necessary to select more than it is expected to exhibit, as some will fall off in condition and will not be suitable for showing. In most instances, the birds will lose a little condition during the first week, after which they should improve, and by the end of about five or six weeks they should be at the height of condition.

It is advisable when the birds have become tame, to allow them a run in an open pen for a few hours during the morning or late afternoon in fine weather, because if they are confined to a coop for a long period the combs are likely to become overgrown.

During the period when the birds are being prepared for show all that is necessary is careful feeding and handling to get the birds quiet, but it is usually not advisable to attempt handling the birds too much during the first week until they have become accustomed to close confinement. There is no necessity to change the ration being fed, but it would be an advantage to add up to 5 per cent. of linseed meal and include cod liver oil at the rate of 1 fluid oz. to 5 lb. of mash. Succulent green feed should be regularly supplied, and a dose of Epsom salts once per week during the first few weeks at the rate of 1 oz. to a gallon of drinking water would be helpful. Shell grit should be available to the birds, as well as some harder grit, such as gravel, to assist in the digestive processes.

Washing Birds.

It is essential that white birds be properly washed before being exhibited, but some exhibitors also wash coloured birds as well. The washing must be carried out correctly, otherwise the birds may appear worse than if not washed at all.

To carry out the washing it is necessary to have a plentiful supply of warm water, towels, and three large bath tubs; also coops lined with clean hessian or cheesecloth. The coops should be placed before a stove or in the sun; the birds should not be exposed to the direct sunlight after washing, as the ear-lobes may become blistered by the sun.

Three lots of water are required for carrying out the washing. The first should be soapy for the actual washing; the second clean water for rinsing, and the third made slightly blue with ordinary laundry blue. In each case the water should be warm but not hot.

To make the soapy bath, dissolve about 4 oz. of best quality soap in about half a gallon of hot water, and then add this to 5 gallons of soft, luke-warm water. The birds should be plunged head first into this bath, after which the head should be held out of the water while the soapy solution is rubbed well into the feathers. Care must be taken not to damage or break the feathers. It is important to soak the birds thoroughly for a sufficient length of time to remove or

loosen all dirt and stains. Usually this will require about ten minutes, but the dirtier the bird the longer the time necessary.

When all traces of dirt are removed the birds should be put through the rinsing water to remove the soap, and then through the blue bath, which will assist in attaining a snow-white appearance in white birds. Unless all traces of soap are removed in the rinsing the result will be unsatisfactory.

After removing the birds from the last bath, as much water as possible should be stroked out of the feathers, after which they should be dried off with clean towels, taking care not to break the feathers in the process.

The washing should be done one or two days before the show to allow the birds to preen out their feathers. On no account should birds be washed twice within one week. It is therefore, advisable for amateurs to practise on a bird not intended for show, in order to gain experience in washing. While carrying out the work a waterproof sheet, covered with a towel should be placed over the knees of the operator, who should be seated on a low box or chair.

It will thus be seen that washing involves a considerable amount of work, but unless white birds are staged in a snow-white condition they suffer in comparison with others which are so prepared.

Handling Birds for Laying Tests.

EACH year it is noted that a fairly large proportion of birds entered for the Hawkesbury Agricultural College egg-laying competition are somewhat older than is desirable. The result is that many break into a moult soon after being penned. This applies particularly to the light breeds which are more susceptible to changes than the heavy breeds. It is obvious that pullets which break into moult at the commencement of a test are severely handicapped compared with those which continue to lay throughout the autumn months. Thus, every effort should be made to pen birds of a suitable age to avoid the moult.

In selecting birds for a competition, a preliminary choice should be made of a larger number than is required, and those who have been allotted pens in the 1948-49 test should make an early start in the selection of the probable competition birds. If at all possible these should be placed in small pens to accustom them to the conditions which will prevail in the competition.

It is advisable to choose numbers of pullets in different stages of development so that when the final choice is made, those of the most suitable age can be selected.

Quality Points.

As the scoring of high quality points has an important bearing upon the winning of some of the major prizes in the competition, competitors should give particular attention to the factors taken into consideration in awarding these points. Care should be taken that the birds are free from serious defects such as sprigs on combs, feathers on shanks and between the toes of breeds which should have clean legs, wrong coloured eyes or legs, crooked breast bones, and wry or squirrel tails. Uniformity of type is another major consideration in the awarding of points; frequently teams entered comprise two or three different types of birds, which results in a lower score of points.

Change of Feeding.

Those who are feeding a ration different from that fed to the competition birds should make a gradual change to the competition ration, otherwise, if the ration varies considerably from that which they will receive upon entering the competition, there is every likewise of a moult ensuing. Although under present conditions it may not be possible to adhere to one set ration for the competition birds, the aim will be to maintain a ration as closely as possible to that outlined below:—

Morning (*wet mash*).

Pollard	60 lb.
Bran	33 lb.
Meat meal	7 lb.
Total	100 lb.

(Salt at the rate of 22 oz. per 100 lb. is dissolved in the water used for mixing.)

(*Continued on page* 112.)

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road Holgate, via Gosford
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa (Jerseys) ...	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Hawkesbury Agricultural College, Richmond (Jerseys)...	106
Hicks Bros., "Meryla," Culcairn (A.I.S.)	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil (Beef Shorthorns) ...	60
McEachern, H., Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, "Jerseymead," Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys) ...	49
New England University College, Armidale (Jerseys) ...	25
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	35
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco (Jerseys)	76
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	37
Salway, A. E., Cobargo (Stud Jerseys)	62
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S.)	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R. "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale ...	62
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.) ...	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	33	23/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/4/49
Cowra Experiment Farm (Ayrshires) ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	3/3/48
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49	17/12/48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Limond Bros., Morisset (Ayrshires)	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys) ...	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys)	94	27/10/48
Riverina Welfare Farm, Yanco (Jerseys) ...	91	11/10/48
Rowntree, E. S., "Mourable," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords)	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)...	119	20/4/48
Yanco Agricultural High School, Yanco (Jerseys)	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle ...	49	14/4/48
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brookfield Afforestation Camp, Mannus ...	209	12/8/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell	32	11/8/48
Coventry Home, Armidale	11	29/9/48
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	25	9/7/47
Forster, N. L., and Sons, "Abington," Armidale	62	24/5/48
Frizelle, W. J., Rosenstein Dairy, Inverell ...	111	9/9/48
Genge, G. L., Euston, Armidale	36	2[illegible]/9/48
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood .	22	20/5/48
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm Gum Flat Road, Inverell	60	30/6/47
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	31	22/9/48
Johnson, A., "Rosedale," Grafton Road, Armidale	34	22/9/48
Kenmore Mental Hospital	52	26/6/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	7	12/12/48
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department,, Rydalmere Mental Hospital	40	20/11/48
McMillan, N., Duval Road, Armidale ...	30	29/9/48
MacNamara, B., "Mount View," Cessnock...	58	16/5/48
Marist Bros. College, Campbelltown ...	70	3/1/48
Mason, A., Killarney, Armidale	33	30/9/48
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
O'Brien, O., "Mount View," Inverell ...	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
St. Ignatius' College, Riverview	27	11/8/48
St. John's Hostel, Armidale	6	24/6/49
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	12	29/12/48
St. Michael's Orphanage, Baulkham Hills ...	43	5/6/48
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boy's Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	53	10/2/48
Tanner, F. S., Dural Rd., Armidale... ...	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale ...	33	30/9/48
Tombs, P. C., Kellys Plains, Armidale ...	49	29/9/48
Tombs, R., Harlwood, Armidale	40	22/9/48
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48
Wallaga Lake Aboriginal Station	19	29/4/47

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.	Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*			Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Waters, A., Marsh Street, Armidale	2	13/10/48	Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48	William Thompson, Masonic School, Baulkham Hills	52	10/6/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47	Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division Animal of Industry.

Poultry Notes—*continued from page* 109.

Midday.

Chaffed green feed—approximately 1½ oz. per bird.

Evening feed.

Wheat	.. .. ..	67 lb.
Maize	.. .. ..	33 lb.
	Total	100 lb.

Those feeding a dry mash should commence the change by giving a small feed of wet mash in the mornings after having closed the dry mash hoppers overnight and then opening the hoppers when the wet mash is fed. The amount of wet mash should be gradually increased and the dry mash hoppers closed for a longer period until a full feed of wet mash is given and no dry mash at all.

More Food for Britain Conferences.

Bathurst and Wagga.

A CONFERENCE to further the Minister for Agriculture's drive for increased production of food for Britain is to be held at Wagga on Thursday, 26th February, commencing at 10 a.m., in the Masonic Hall.

Similar successful conferences have already been held by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) at Sydney, Newcastle, Kempsey and Lismore, and another is to be held at Bathurst on 13th February.

Announcing his decision to hold the Wagga conference, the Minister said that Britain was desperately in need of increased supplies of the products of our major primary industries—butter, beef, mutton, lamb and pig meats, wheat, eggs, etc.

Whilst he was confident, said Mr. Graham, that an appeal merely on humanitarian grounds would succeed, when Australians fully realised Britain's plight, there was also a business angle to this drive for an immediate and substantial increase in production. Britain was offering long-term contracts for supply of the foodstuffs she most needed and the prices offered were payable.

The thing to realise, however, was that Britain's need was urgent.

Mr. Graham said that the Wagga conference should be attended by representatives of all sections of industry (primary and secondary) and of the general public (rural and urban). Such a gathering could examine difficulties in the way of increased production and plan for their removal. It was a job for all, not solely for primary producers.

Australia's Opportunity

To Meet Britain's Need.

NEVER before had Australian primary producers had such an opportunity to develop the resources of this country as they would have during the next two or three generations.

This statement was made by Sir Henry Turner, Leader of the Meat Section of the British Food Mission at Wagga on 26th February, addressing delegates to the most recent "Food for Britain" Conference convened by the Hon. E. H. Graham, M.L.A., Minister for Agriculture.

The Mission was here to conduct negotiations on a business basis, said Sir Henry, and if producers were prepared to overcome the difficulties which existed there was an opportunity which could be developed to the very great benefit of themselves, their children and Australia.

Britain would never be able to produce more than half the food required to feed her 50,000,000 people—and in the case of meat, not even half. Although it was the policy of the British Government to restore meat production to what it was before the war, this could not be achieved for at least five years, said Sir Henry.

At present the British people had a ration of 1s. worth of meat per head per week. It was the hope of the British Government to increase the meat ration to a consumption of 140 lb. per head per annum—half the Australian consumption rate. To do this, 750,000 tons of butcher's meat per annum was needed in addition to the amount at present available.

Additional meat could not be obtained from North America in view of the dollar position, and little help could be expected from Canada because that country was tied up with American economy. South America had been a big source of supply in the past, but the Argentine was now an unreliable source of supply.

The only possible places from which Britain could obtain increased supplies of meat were South Africa, New Zealand and Australia. So far as South Africa was concerned, diseases and other difficulties which had to be overcome would tax the ingenuity of the South African people for a long time. New Zealand could not increase its meat exports without further intensifying farming, and this had been done to a great extent already.

Australia, however, had tremendous possibilities and Great Britain was prepared to take twice as much meat as she had ever

taken before—and even three times as much.

There was a wonderful short-term opportunity for Australia to sell Britain vastly more pigs, and Britain would take all the poultry meat Australia could produce. Sheep and cattle would, in the long run, be more important than pigs and poultry but the latter would be very valuable in meeting present needs.

There were, of course, difficulties to be overcome in increasing the production of meat foods, particularly those of labour, transport and taxation, said Sir Henry, but the spirit of enterprise and initiative of Australian producers, he was sure, could surmount them, and these Australian industries could be developed in a way never experienced before.

Hawkesbury Agricultural College Scholarships Awarded.

THE Government Farrer Scholarship tenable in the Agriculture Diploma Course at Hawkesbury Agricultural College, Richmond, has been awarded to Richard Gorman, of the S. A. Gill Salvation Army Memorial Home for Boys, South Goulburn.

In making this announcement, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said that Gorman, who is 18½ years of age, had been a pupil of the Goulburn High School, where he had sat for the Intermediate Certificate examination and subsequently the Leaving Certificate examination. He had been elected prefect at the school early in 1946. Whilst at the Gill Memorial Home he had had an opportunity of acquiring some experience in attending to livestock (including poultry and cows) and in vegetable growing.

It had been necessary for the candidates to pass in at least seven subjects of the Intermediate Certificate examination, the award of the scholarship being determined mainly on the aggregate marks of three "externally examined" subjects. Consideration had also been given to other relevant factors, such as additional educational qualifications as well as aptitude, fitness, physical strength and other qualifications necessary for success in agricultural work.

The Minister also announced that the scholarship donated by the Agricultural Bureau of New South Wales, which was also available for the Agriculture Diploma Course at Hawkesbury, had been awarded by the Bureau to Alfred Lionel Cannings. The conditions governing the award of this scholarship were similar to those for the Government Farrer Scholarship.

The successful candidate, who was just under 17 years of age, was the son of Mr. and Mrs. W. P. Cannings, who were dairy farming at Tregeagle, in the Lismore district. He had passed the Intermediate Certificate examination at the Lismore High School and was a member of the Junior Farmers' Club. Cannings had taken part in field days and had been successful at the Royal and local shows. He had represented the Far North Coast in radio-speaking contests and field day broadcasts, and had conducted a vegetable-growing project under the Junior Farmers' Club movement.

Both scholars would enter the Hawkesbury College and would be admitted to the first year of the Diploma Course in Agriculture.

Bush Fire Risk Acute in Far West.

THE Chief Secretary, Mr. Baddeley, has issued a warning that the fire danger in many parts of New South Wales makes it imperative for every citizen to exercise the greatest possible care when using fire in the open air.

The fire risk existed mainly west of the mountains, and in the far west could be described as acute. In consequence, the following conditions which had been placed on the lighting of fires should be rigidly observed, said Mr. Baddeley.

Burning Off.—A permit first to be obtained from the Council or from some person authorised by the Council.

Camp Fires, Cooking Fires, Etc.—To be lit in a properly constructed fireplace with a space of 10 feet cleared around such fireplace. If no fireplace available, a space of 10 feet to be cleared around the site of the fire. Fires not to be lit in either case within 15 feet of any log or stump.

Rubbish Fires.—To be lit in incinerators; if incinerators not available, between the hours of 7 p.m. and 7 a.m. and extinguished not later than 7 a.m. A space of 15 feet to be cleared around the fire.

Charcoal Burning, Eucalyptus Distillation, Etc.—A space of 100 feet to be cleared around the site of the fire.

It was also an offence to leave any fire without first extinguishing it, warned Mr. Baddeley. Heavy penalties were prescribed for such breaches of the law.

TIDYING-UP THE F.A.Q.

GEO. L. SUTTON, D.Sc. (Ag.).*

DR. SUTTON was at one time an officer of this Department, and subsequently joined the Western Australian Department. He has had a long and wide association with the evolution of the growing and marketing of wheat in Australia. His views on the need for change in our methods of wheat marketing are timely, particularly in view of the strong recommendation that Australia should alter its system of marketing, made a year ago by Dr. Kent Jones.

What is the F.A.Q. and why does it need tidying up? The F.A.Q. is the "Standard" by which wheat is bought and sold throughout Australia. It is so called because the letters F, A and Q are the initial letters of the words "Fair Average Quality" and by custom have become recognised as the commercial abbreviation of that term—and also because, as far as is humanly practicable, it represents the fair average quality of the crop of the particular season for which it is fixed.

Origin of the F.A.Q.

Trading according to the F.A.Q. standard was introduced in South Australia in 1788, later in Victoria, then in New South Wales and in 1905 in Western Australia. In the early days of our agricultural history when the market was a restricted localised one, commercial standards for the purpose of trading in Australian wheat were unnecessary; under such circumstances wheat could be, and was, sold by sample, *i.e.*, its quality was judged by a fair sample shown to, and examined by, the buyer at the time of purchase.

Immediately, however, the personal contact between buyer and seller was broken, or became impossible—as in the case of wheat sold overseas—then commercial trading standards became necessary in order to smooth out the difficulties incidental to trading when distance separates the buyer from the seller. And so, because of the evolution of our wheat industry with its expanding production, trading by sample gave place to trading under the F.A.Q. standard.

Method of Determination.

The F.A.Q. standard is fixed in each State by the Chambers of Commerce. In order to ascertain what the F.A.Q. standard shall be, representative samples are collected from the wheat receiving centres throughout each State. The amount from each centre bears a definite proportion to the quantity received at the centre, say 1 lb. per 12,000 bushels. The quantity used from each centre to make up the composite parcel representing the average of the season's harvest, is the proportion which the Statistician's estimate for that district bears to his estimated State yield.

The representative district samples having been thoroughly mixed, the bushel weight is then ascertained with the utmost accuracy.

In Western Australia the bushel weight is obtained in two ways:—

(1) By weighing the contents of a "struck" Imperial bushel measure, and

(2) By means of the Schopper litre Chondrometer.

The weight or weights thus ascertained are then declared and are the only declarations made by the Chambers of Commerce. Those for Western Australia for the current season, which were signed as usual by all those participating in the proceedings, read:

> "That the Western Australian internal F.A.Q. standard for the 1947-48 season on the basis of the certified Standard Imperial Bushel Measure, weighed on a certified Fairbanks scale and on the basis of the Australian Standard Chondrometer be declared at 63 lb."
>
> "That the Western Australian F.A.Q. Standard for the 1947-48 season on the basis of the Schopper litre scale Chondrometer and on the conversion table drawn up by the German Imperial Standards Commission, be declared at 64½ lb."

* An elaboration of an address recently broadcast by Dr. Sutton over the A.B.C. National Stations.

The introduction of the declaration of the weight according to the Schopper Litre Chondrometer is comparatively recent. It was introduced as the result of each State Chamber being presented with a Schopper Chondrometer by some of the wheat merchants of each State, with the very commendable object of having the method of ascertaining bushel weight of the F.A.Q. Standard uniform throughout the Commonwealth. It is, however, extremely unsatisfactory in that the extremely sensitive Schopper Chondrometer does not indicate the bushel weight as does the Australian Standard Chondrometer. It determines, very accurately, the weight of a litre of the commercial wheat forming the F.A.Q. standard, and from this weight that of a bushel measure of similar grain has been calculated and is obtained from a conversion table which sets out the results of calculations made for the purpose. These calculations have never coincided with the weight of the grain as measured in the Imperial bushel measure in Western Australia. It will be seen from the declarations that the difference between the calculated and actual bushel weights is 1½ lb. for the 1947-48 season.

Sealed Samples Distributed.

After the bushel weight has been declared, the bulk composite parcel of the F.A.Q. standard is then divided in samples of about 1 lb. These are sealed and sent to the Corn Trade Associations at Hull, Liverpool, and London, to Chambers of Commerce, wheat merchants and others interested in the wheat trade. These interested parties are thus enabled to see what a sample of the average crop is like, and are thereby enabled to form their opinion as to the value of the wheat crop from their representative sample of the F.A.Q. standard.

The Chambers of Commerce are justly proud of the equitable methods by which the wheat for the F.A.Q. standard is obtained and its weight determined.

As the result of forty years association with fixing the F.A.Q. standard, first in New South Wales and since 1911 in Western Australia I have no hesitation in stating that no effort is spared to make the wheat comprising the standard a fair representation of the grain harvested and delivered for sale. Nor can I suggest any method by which it can be improved. If so, why is there any necessity for "tidying it up"?

Bushel Weight No Longer a Guide to Value.

The first reason is that though the method of obtaining the standard and ascertaining its bushel weight is excellent, the bushel weight of the standard is no longer a reliable guide as to its value.

When the present practice of declaring the bushel weight of the average crop was initiated it was a much sounder practice, for the adoption of the bushel weight as a standard for assessing the monetary value of the wheat crop arose from the knowledge that the milling value of clean wheat, *i.e.*, commercial wheat free from admixture and screenings, is indicated by its bushel weight; and further, if the admixture in two samples is of the same kind, the bushel weight will indicate the degree of admixture.

Commercial wheat at that time was usually a well "dressed" or cleaned sample and the admixture was mainly of the same type. Since then, however, a change in our harvesting technique has resulted in a larger percentage of unmillable material of a more variable character in the commercial wheat. The bushel weight of a parcel of commercial wheat, harvested under present day conditions, is therefore now no longer a reliable guide as to its milling value.

This is obviously the view held by those in authoritative positions in the London Corn Trade Association, for it has been learnt from a most reliable source (Mr. J. S. Teasdale) that the arbitrators of that Association, in their assessments, ignore the official declaration regarding the bushel weight. Obviously it is therefore quite unnecessary.

Some interesting information regarding the inadequacy of the bushel weight of commercial wheat (*i.e.*, the millable grain with its admixture) for assessing its milling or commercial value, is available from the details of the F.A.Q. standards fixed during the seasons 1922-23 to 1945-46 inclusive.

One of the comparisons is that between the F.A.Q. standards which had respectively the lowest bushel weight and that which contained the lowest percentage of millable

grain. The wheat in both standards was the usual normal type; it is, therefore, reasonable to assume it was of similar milling value and therefore comparable. The lowest bushel weight was 60 lb. declared in 1943-44; this standard contained 96.40 per cent. of millable grain. The F.A.Q. standard of 1927-28 contained 94.40 per cent. of millable grain; this was the lowest recorded for the period referred to. Its bushel weight was 61½ lb. or 1½ lb. heavier than the standard for 1943-44. It is impossible to believe that a commercial miller would accept such wheat, despite its higher bushel weight of 1½ lb. in preference to the other which contained almost 2 per cent. (1.9 per cent.) more millable grain.

Additional Evidence on this Point.

Additional evidence on this point was furnished by experiment conducted in 1926 when Mr. F. L. Shier, B.Sc. Agr., an Agricultural Adviser of the Western Australian Department of Agriculture, found that one sample of commercial wheat with 97 per cent. of millable wheat had the same bushel weight as another which had nearly 1 per cent. more millable grain in it, and in consequence was worth 3d. per quarter more. Some years later another adviser, Mr. P. H. Roberts, B.Sc. Agr. found, experimentally that a parcel of wheat containing exactly the same quantity of unmillable material, 4.2 per cent., as the F.A.Q. standard of that year, with which it was compared, had a bushel weight of 58 lb., or 4½ lb. less than that of the F.A.Q. The unmillable material in both cases was of the same kind, but in the case of the F.A.Q. standard, screenings predominated and constituted about 3.8 per cent. by weight of the total sample; in the other sample the principal unmillable material—3.8 per cent.—was "cocky chaff" (empty glumes).

It is thus obvious that the bushel weight of commercial wheat is influenced not only by the total quantity of its unmillable material but also by the kinds and the proportion of each kind of unmillable matter it contains. In consequence the bushel weights of different parcels of commercial wheat can be used for comparative purposes only when the unmillable material is the same kind with regard to the character.

Seeing then that the bushel weight of commercial wheat is not a guide to its milling or monetary value, and is quite unnecessary, is it not farcical that the leading men in the wheat trade should assemble annually and officially declare it and that such declaration should carry the imprimatur of the Chamber of Commerce in all the wheat exporting States? It has been the more farcical during the war years, because the wartime regulations prescribe that wheat weighing not less than 59 lb. per bushel shall be accepted for inclusion without dockage in commercial wheat of the F.A.Q. standard. Surely it is now time to tidy up this aspect of the F.A.Q.—to discontinue the unnecessary and unsound declaration of the bushel weight of the F.A.Q. and so remove from intelligent men the stigma of doing something that is ridiculous, particularly as it is ignored even by the British buyer for whose special benefit it is interded.

The Declaration is Too Late to be of Use.

Another disadvantage associated with the F.A.Q. standard is that it is obviously impossible to obtain a representative sample of the current seasons crop until practically the whole of it has been harvested and delivered to the receiving centres late in January or early in February. In pre-war days about 60 per cent. of the exportable surplus would have been shipped by this time and before the F.A.Q. standard is fixed. How then can our main crop of wheat be bought and sold according to a standard which does not exist? It cannot, it is only supposed to be.

Such a position would be impossible but for the fact that those in the "wheat trade" no longer attach to the term F.A.Q. its original and literal meaning. It is obvious that the term, as with chaff and oats, has acquired a permanent meaning, and is now a standard representing the fair average quality of a crop in a normal season and not the average of the whole crop in any season. It has, therefore, become a permanent unofficial standard, and as such has the disadvantage of being somewhat indefinite due to the slight differences in the varying viewpoints of the individuals who operate it. These disadvantages would disappear if it were made a permanent official standard which would be definite as well as simple.

The fact that Australian wheat is only supposed to be bought and sold according to the official F.A.Q. standard, is recognised by the London Corn Trade Association, and accordingly in its contract under which Australian wheat is bought by its members, provision is made for this contingency by the following proviso: "In the event of no F.A.Q. standard being established the arbitrators shall in their discretion decide what is the 'fair average quality'." This certainly wants tidying up.

Uncertain Milling Value Affects Price.

It seems obvious that the uncertainty regarding the milling value of the wheat which is offered to the prospective buyer must be reflected adversely in the price he is prepared to pay for it so as to offset the risk involved. For there is a risk. It is true that he has information regarding past standards to guide him, but these are by no means uniform. If comparisons of the bushel weight—for what little it is worth—be made, it is found that in Western Australia that this has ranged from 60 lb. to 64½ lb. There have been one standard each of 60, 60¾, 61¾, 63 and 63½ lb., two each of 60½, 61, 62¼ and 62¾ lb., three of 61¼ and 63 lb., six of 61½ and 62½ and twelve of 62 lb.

Percentage of Millable Grain as a Guide.

And now what of a much more reliable guide, *i.e.*, the millable grain in the standard. Information on this point is available regarding the Western Australian Standards from 1922-23 to 1946-47. The percentage of millable grain ranges from 94.50 to 97.58 per cent. There have been two standards with under 96 per cent. of millable grain, nine with between 96 per cent. and 97 per cent. and 14 with 97 per cent. or more.

Quite a mixed bag in both cases. It seems that the extent of these variations requires that the prospective buyer protect himself against the risk associated with the purchase of a commodity of such variability. And with resulting loss to the grower.

Others share my view in this connection. Mr. A. Sutherland, President of the New South Wales Flour Millowner's Association said (I think in 1938) be felt so dissatisfied with the F.A.Q. system that "he hoped this would be the last time they would ever meet to fix the F.A.Q.," and that "Australian wheat would never command the price it should, until it was properly graded." These latter words are very significant and economically important. Further, they are almost identical with those spoken in Paris to Mr. Hardwick, an Australian Engineer by a principal of an important international firm of wheat merchants who was a fellow guest at an official luncheon. He said in effect, and of course, in another language, "You Australians will never get the real value of your wheat, whilst you continue to sell it according to the F.A.Q." This is a very potent reason for "tidying up the F.A.Q."

The loss due to the risk which must be taken by overseas buyers of Australian wheat and which is directly reflected in the price paid by Australian buyers may reasonably be 1 or 2 per cent. At 1 per cent. and with a saleable crop of 150,000,000 bushels valued at 5s. per bushel, this avoidable loss amounts to £375,000, which should be retained by the growers.

The grower should not allow himself to be misled by the belief that this does not concern him, by thinking that any loss is borne by the merchant who sells to the overseas buyer. This is fallacious reasoning, for the price local buyers pay the grower is governed by what they expect to, or have arranged to, receive from the overseas buyer.

Australian Wheat is Marketed on "Sample."

Seeing that the bushel weight of commercial wheat is not a guide to its milling value, and as it is determined mainly for the information of the British buyers, by whom it is in effect ignored, it follows that both in Australia and Britain, Australian wheat is marketed on "sample" of which that of the F.A.Q. standard is representative.

Under these conditions it follows that the relative value of a commercial parcel of wheat is determined by comparison with the F.A.Q. standard and as the result of a visual examination. In consequence, disputes are decided by the personal opinion of the arbitrator. This is obviously quite unsatisfactory, however experienced and honourable the arbitrator may be. This practice should only be tolerated when the factors in dispute cannot be measured. In

(*Continued on page 164.*)

Return of—

YANCO EXPERIMENT FARM

To the Department of Agriculture.

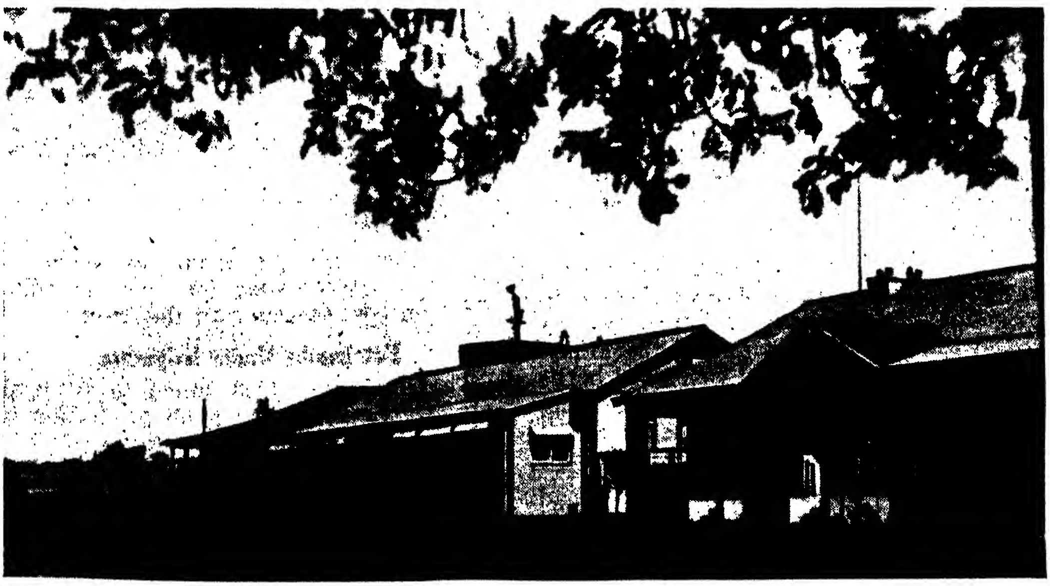
SUCCESSFUL FIELD DAY.

APPROXIMATELY 300 farmers from the Murrumbidgee Irrigation Area attended the Field Day held at Yanco Experiment Farm on 4th February on the occasion of the formal taking over of the Farm by the Hon. E. H. Graham, M.L.A., Minister for Agriculture, on behalf of the Department.

Many local organisations were represented and the Minister was accompanied by Dr. R. J. Noble, Under Secretary and Director, and the Chiefs of the several Divisions of the Department interested in the work at Yanco Experiment Farm.

The visitors, who were entertained at afternoon tea, made an informal inspection of the Farm. They showed great interest in the plots of cotton, peanuts, soybeans and other crops as well as in the orchard and vineyard, while the stock, including the imported bull "Bellavista Samaritan Royal," purchased by the Overseas Stock Buying Delegation and now stationed at this Farm, attracted much attention.

Mr. P. F. Stanton, Manager of the Farm, welcomed the visitors, and Dr. R. J. Noble, Under Secretary and Director of the Department, introduced the Minister to the gathering. The past four or five years had been perhaps the most difficult in the agricultural history of the State, said Dr. Noble. Following the great problems of food production in the concluding war years, there had been a drought, and now the difficulties of the recent harvest. It had been a privilege to work with Mr. Graham during this period. This was a notable occasion—it was hard to believe that the Farm was actually again under the control of the Department after a period of twenty years. With such a beginning it was hoped that much work would be accomplished in the years ahead.



Office and Staff Quarters at Yanco Experiment Farm.

The Minister's Address.

"This occasion is a milestone in the history of the Murrumbidgee Irrigation Area," said Mr. Graham, addressing the visitors assembled in the main hall. "Without this Farm we have had great difficulty in carrying out our experiment work.

"Yanco Experiment Farm is admirably suited to the type of work we have in mind. The Farm will not be run on semi-commercial lines as had been done to some extent in previous years. Scientific investigation will be the aim at this Farm and of all our Experiment Farms."

The Irrigation Research and Extension Committee set up at Griffith in September last would be associated with the Farm's activities in an advisory capacity, said the Minister.

Yanco Farm was originally established in 1908, and had been of great benefit to irrigation settlers, many of whom had received training there, continued the Minister. Work in the past had concerned horticultural and many other crops, including rice. The first rice crops on the Area had been grown on the Farm.

In 1908 the Government of the day had transferred the Farm to the Department of Education and it had then been known as Riverina Welfare Farm. Mr. Graham paid a tribute to the contribution made by the Farm during the war. Tremendous quantities of seed produced had enabled very large areas of vegetable crops to be grown to supply foodstuffs to the allied forces in the Pacific.

Experiment work would now be conducted with many field and horticultural crops and in connection with dairying. With rice in particular, breeding work and numerous experiments would be put in hand.

Several Hundred M.I.A. Farmers attended Yanco Experiment Farm Field Day on 4th February.
The Farm is again under the control of Department of Agriculture.

The Jersey stud at the Farm included the blood of "Design's Ruler" (imp.), possibly the most sought after to-day, said Mr. Graham. Also one of the animals recently imported by the Overseas Stud Stock Buying Delegation, "Bellavista Samaritan Royal" (imp. Canada), was now stationed at this Farm.

The Berkshire pig stud was noted for quality. Litter testing and pig recording had been commenced with this stud.

Fat Lambs Under Irrigation.

The Farm was well suited to fat lamb raising. "Expansion in lamb production in this State will be under irrigation," said Mr. Graham. "Irrigation is necessary to ensure continuity of supply to the country killing units.

"Any development of irrigation in this State will call for greater quantities of water. The fertile Murrumbidgee Valley

can only be brought into full production with large increases of conserved water.

Refresher Courses for Ex-servicemen are being continued at Yanco Experiment Farm. These Courses are for men holding a Q.C.; that is, for those who have already had some experience in primary production.

They are of eight weeks' duration and for part of that period students may specialise in their particular branch of agriculture.

The commencing dates of future Courses at Yanco are 5th April, 7th June and 9th August.

There are still vacancies for the June and August Courses. Full particulars and application forms may be obtained from the—

Deputy Controller of Rural Training,
c/o. Department of Agriculture,
Box 36A, G.P.O.,
Sydney.

The diversion of the Snowy River into the Murrumbidgee is the best means of providing sufficient water to irrigate additional areas." Sites were being investigated for dams on the Tumut River and Tarcutta Creek, said Mr. Graham, but this would only provide relatively small additional quantities of water.

"The Murrumbidgee River is in this State and New South Wales should have first call on the Snowy River waters," said Mr. Graham. "People in Victoria advanced claims for the use of the Snowy River waters for hydro-electric development because the Snowy flowed through Victoria for a short distance. Electricity can be generated from other sources, but there is no alternative to water for irrigation. If New South Wales landowners wish the Snowy River to be diverted into the Murrumbidgee, they must organise and demand that this be done."

Mr. A. G. Enticknap, M.L.A., Member for Murrumbidgee, briefly addressed the gathering. He said the return of the Farm to the Department of Agriculture for irrigation experiment work was of significance to the whole of Australia. It was essential that sufficient funds be made available to the Department to carry out this work.

Ex-servicemen's Refresher Course.

Mr. Graham lunched at the Farm with the ex-servicemen students attending the first Refresher Course held at Yanco. He expressed his pleasure at the fine types of young men attending this Course to equip themselves for the task of becoming efficient primary producers.

The Commonwealth and State Governments, he said, were working together to help these students make good. He felt that the best that could be given them was the least to which they were entitled. The community had a duty to assist such young men to succeed in life in return for the service they had rendered their country.

The earlier courses had been held at Wagga Experiment Farm but that institu-

(Continued on page 164.)

The Imported Jersey Bull "Bellavista Samaritan Royal."
This bull was purchased for the Department by the Overseas Stud Stock Buying Delegation, and is now stationed at Yanco Experiment Farm. Great interest was shown in the animal by the visitors to the Field Day.

THE BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics.

RETURNS FROM WHEAT GROWING.

DURING the past four years the Division of Marketing and Agricultural Economics has been conducting a survey of the income and costs of a number of wheatgrowers in different parts of the State. The analysis of figures obtained for the financial year which ended 30th June last is not yet completed; however, the figures for the two previous years are available and are of particular interest in that the financial year 1944-45 was a year of severe drought in all of the State's wheatgrowing districts other than the North-West, while in the following year, 1945-46, all wheat areas experienced a very favourable season.

The figures which follow illustrate the very great variation in incomes with which the primary producers of this country frequently have to contend.

Before quoting any figures, however, it is necessary to make one or two points by way of explanation. Firstly, while all the farmers concerned are wheat-growers they also all derived part of their income from either wool-growing or fat lamb raising or both, while many obtained a substantial part of their income from the sale of oats, fodder and pigs. Nevertheless, the predominant source of income in almost every case was wheat.

In 1944-45 records were kept on twenty farms in four different districts; the districts were Gunnedah (unaffected by drought), Parkes, Wagga Wagga and Culcairn. In 1945-46 eighteen records were kept, all the farms being in the Parkes-Forbes district. The farms on which records were kept and analysed in the two years are, therefore, not the same, except in three or four cases.

The size of the farms for which analyses have been made varied considerably, but the variation is typical of the wheat properties in the various districts. There was no correlation between farm size and net income in either year.

Net Farm Income.

Net farm income (the farmer's net income taking into account all family labour —whether paid or not—but excluding interest payments) varied in 1944-45 from £1,803 to a negative figure (representing a net loss) of £1,030. In 1945-46 net income varied between £3,391 and £400, no farmers showing a net loss.

Operator's Earnings.

Operator's earnings (which are obtained by subtracting interest at 5 per cent. on the total farm capital from net farm income) varied between £1,153 and a negative figure of £1,431 in 1944-45 and between £2,561 and a negative figure of £22 in 1945-46.*

*The farmer who showed a net farm income of only £400 and a negative figure of £22 for operator's earnings was ill for the greater part of the year and the figures do not reflect the true earning capacity of the farm.

Income Earned on Farmers' Own Invested Capital.

The income earned on farmers' own invested capital also varied very considerably in the two years. In 1944-45 only nine farmers showed any return on their own farm capital; this varied from 11.3 per cent. to .5 per cent. In 1945-46 all farmers showed a return on their investment, varying from 31.1 per cent. to .4 per cent.

The accompanying table sets out the figures in more detail; however, it must be remembered that the farms in the two years are not the same.

SELECTED WHEATGROWER'S INCOME AND RETURNS, 1944-45 and 1945-46.

Net Farm Income.	Operator's Earnings.	Percentage Return on Farmer's Own Capital.
Financial Year, 1944-45.		
£	£	Per cent.
*1,803	1,153	11.3
1,320	485	8.0
*1,121	429	5.6
*731	397	6.6
681	38	2.3
524	-71	1.9
523	101	1.7
514	51	1.9
502	-320	...
467	12	1.3
399	-178	...
319	-600	...
301	-391	...
208	-170	...
205	-160	...
83	-357	...
32	-633	...
-86	-1,077	...
-307	-572	...
-1,030	-1,431	...
Financial Year, 1945-46.		
3,391	2,561	31.1
2,618	1,677	17.7
2,539	1,938	18.7
2,531	1,714	16.8
2,248	1,440	12.0
2,146	1,523	23.7
2,133	1,289	10.8
1,649	1,106	12.8
1,536	1,219	25.8
1,285	856	16.4
1,176	763	13.2
1,175	817	12.0
1,069	525	9.0
1,007	625	9.9
977	700	20.3
957	532	8.4
908	450	7.2
400	-22	0.4

* Farms situated in the Gunnedah district.

Marketing of Fruit and Vegetables.

Standardisation of Packages and Grades.

The Vegetable Growers' Association has formally advised the Minister for Agriculture that agreement has been reached between producers to standardise packages for peas and beans.

This will mean that if all producers conform to the decision of their representative body, producers will, in the future, market beans and peas in a standard 2½ to 3 bushel, loose mesh bag. In effect, this agreement gives little more than formal recognition to practices already prevalent, namely, the routine procedure of the better-known commercial growers of packing beans and peas in a standard-size bag. Whether the chance-crop grower, the backyard producer and the less advanced farmer will voluntarily adopt such a standard container remains to be seen.

Concurrently, the Commonwealth Chamber of Fruit and Vegetable Industries has been asked by the Australian Agricultural Council to submit for consideration by the various Departments of Agriculture, detailed proposals for the standardisation of packages of fruit and vegetables throughout the Commonwealth. The Commonwealth organisation has issued invitations to representative bodies to be present at a conference to be held in Melbourne on Monday, 12th and Tuesday, 13th April, 1948, when the matter of standardisation of packages and the adoption of uniform grade standards for tomatoes will be discussed.

At the present time a docket is required to be issued by the selling agent for all sales of fruit and tomatoes, irrespective of the method of packing. The application of a docket system to cover all fruit and vegetables, however, has been held over, pending certain technicalities being overcome. These are largely associated with standardisation of packages.

Important to Orderly Marketing.

The packing of fruit and vegetables by standards and grades is one of the most important means available for the orderly marketing and efficient buying and selling of products. This is universally admitted, although, with respect to primary produce,

it is certainly more difficult to obtain clear and definite standards than is perhaps the case with other forms of merchandise.

Briefly, the merits of standardised grades and packages are:—

Clear and definite standards are indispensable in the settlement of disputes between buyers and sellers; they help make easier the settlement of claims against transport agencies. Standardised grades form the basis for market news prices and are an essential factor in an intelligent comparison of market prices. Separation of products into various grades provides growers with a basis on which to pool their products in co-operative marketing associations, so that they all may share equitably in the season's sales.

Market demands vary, and effective distribution consists in finding the market which will give the greatest return for the grade of product offered for sale. The desirability of standard grades as a basis for advertising is self-evident, since advertising is meaningless unless backed up by products, graded and packed. Finally, trading on the basis of quality is the greatest stimulus to better methods of production and marketing because it helps growers and shippers to correct their mistakes.

Currency Devaluation and You.

AUSTRALIAN primary producers have a direct interest in the economic effects of the recent war on international trade and exchange. Western European nations have had to face up to many monetary problems since the defeat of the Axis Powers, and the processes of recovery have not been as speedy and successful as was originally hoped. Many of their immediate needs have had to be obtained from the so-called "dollar" areas, i.e., from the United States and other countries which have demanded American dollars as part or whole payment.

Production in Western Europe has been hampered, not only by the technical problems of restoration created by a devastating war, but nature itself has not been kind. Last year, a serious drought minimised grain supplies, and then, one of the worst winters in recent experience brought its own problems. Food imports from the United States and the British Dominions kept mass starvation barely at bay. High prices and inflation hampered French recovery very seriously. Great Britain, which had relied on income from foreign investments to import more food and other products than she would otherwise have been unable to afford from her income from exports, was forced to sell many of these investments during the war.

To relieve the stringency of her position, France has just devalued her currency, and there is speculation as to whether Britain will follow her example.

What Does Currency Devaluation Mean?

What does devaluation of a nation's currency actually mean, and, what is the likely effect on the Australian producer if Australia is trading with that nation?

Since the beginning of war, prices of both primary and industrial production have been rising, both inside the nations and at the international level. This means that our money has less purchasing power in terms of goods bought than before. The French Government has decided to meet this fall in purchasing power by making each individual franc worth less than previously in terms of other Governments' currencies. For example, one £ sterling would previously exchange for 480 francs; now it will buy 864. The franc is no longer as valuable as before. What is the purpose of this action? It means that France says to people with whom she wishes to trade, *i.e.*, the Americans: "Here are nearly twice as many francs as before for your dollars, so that you can buy my goods." France thus hopes to increase her income from foreign trade, because her goods will cost buyers less. From this larger income from trade, France would try to put more money in Frenchmen's pockets to meet her high internal inflationary prices.

Effect of Devaluation of Franc in Australia.

This is the basic explanation of France's action. For Australia, it means that French goods will be cheaper to import, and that our goods will sell dearer in France. When present acute shortages are relieved, this may mean a drop in Australian exports, *e.g.*, wool to France.

Now France will be able to commence undercutting Britain in competitive markets, particularly the United States. Should the competition become serious, Britain may herself find it necessary to devalue her currency. One important result would be that she would have to pay more for her imports, and the rise in cost would be in proportion to the extent of devaluation decided upon.

The French action has a definite effect on Australia's balance of payments, *i.e.*, our foreign trade balance sheet. But if British devaluation were to follow, the effect would be far more serious. Quite apart from any other consideration, it would mean that the French action had not been successfully isolated; that instead it had commenced a chain reaction, which could quite conceivably mean that all important currencies would be successively devalued, and, no general betterment of economic conditions achieved.

Effect of Sterling Devaluation.

How would sterling devaluation affect Australia? If the £ sterling were to be devalued and Australia took no retaliatory action, *i.e.*, the £A was kept stable, Britain would need to give us more sterling for a given quantity of Australian exports. On present quantities of exports to Britain, this would place a bigger burden upon Britain. But it would also mean that Australian exporters, particularly primary producers, would receive lower incomes in Australia from sterling received abroad from sale of our exports.

On the other hand, if we were to devalue our own currency and maintain the same ratio of £A to £ stg., *i.e.*, 80 per cent., we would raise the cost of our imports from "dollar" areas enormously, and a sharp inflationary trend would be set in motion because of the increased demand for goods in short supply.

The Changed Pastoral Outlook.

THE present pastoral outlook in the State, as indicated in the latest "Review of Grass Conditions and Pastoral Outlook in New South Wales" issued 11th February, 1948, contrasts vividly with the position existing just twelve months ago. An examination of this Review and that for the corresponding period last year not only emphasises the extreme variability of rainfall in New South Wales, but also the recuperative capacity of the lands of this State —their ability to yield bounteously under favourable meteorological conditions.

In 1946 severe drought conditions prevailed over the greater part of the State Crops failed entirely in many areas and the pastoral position gradually deteriorated. By January, 1947, the outlook, for the most part, was unsatisfactory to critical. A large portion of the State was drought-stricken and adverse weather conditions caused a rapid deterioration in many districts where the feed position had been more or less satisfactory at the commencement of the month. Only in the extreme north-east sector of the State was the position at all hopeful.

The late summer of 1947 brought a welcome break in the dry conditions and saw the commencement of what was to prove the best year on record for some cereal crops and possibly the best for pastures. The pastoral position gradually improved. Despite the ravages of grasshoppers and the extensive leeway to be made up in many districts, continuous showery weather coupled with a mild and abnormally cool late spring and summer, promoted a remarkable growth of grasses and herbages throughout the greater part of the State. In the latest Review, pastures are described as satisfactory to excellent, while many districts of the State are enjoying the best season for a considerable number of years. Drier and normal hot conditions set in about the middle of January, 1948, and pastures have since dried out considerably in the warmer parts of the State.

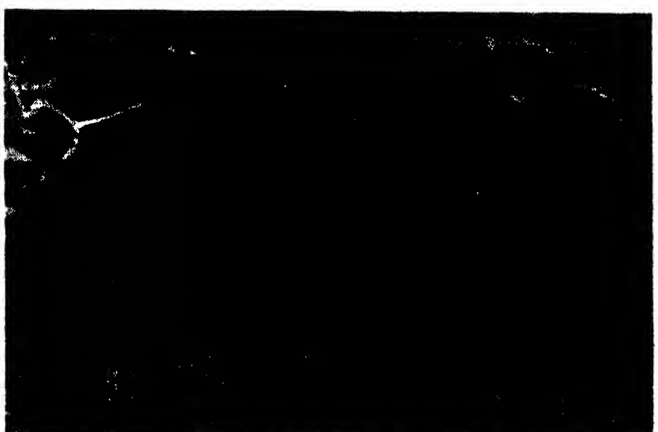
Disadvantages attending the unusual season include the development of the bushfire hazard and the rapid increase in the rabbit population. Perhaps the most unfortunate aspect of the present pastoral position is that we are unable to take full advantage of the bounteous feed available owing to the acute shortage of stock. Suitable stores are very difficult to procure and owners are obliged, in most instances, to rely on natural increases for restocking purposes. Fortunately, the good season resulted in a very satisfactory lambing last spring.

ERISON OF HARVIESTOUN.

Sire of Supreme Champion at Perth (Scotland) 1948 Show.

FURTHER evidence of the high standard of stock imported by the New South Wales Stud Stock Buying Delegation is contained in a message received by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) from Lord Rosebery, owner of the Dalmeny Stud, Edinburgh, Scotland.

The message stated that a bull sired by the Aberdeen Angus bull "Erison of Harviestoun," purchased by the Delegation for the Department, won the Supreme Championship at the 1948 Perth (Scotland) Show.



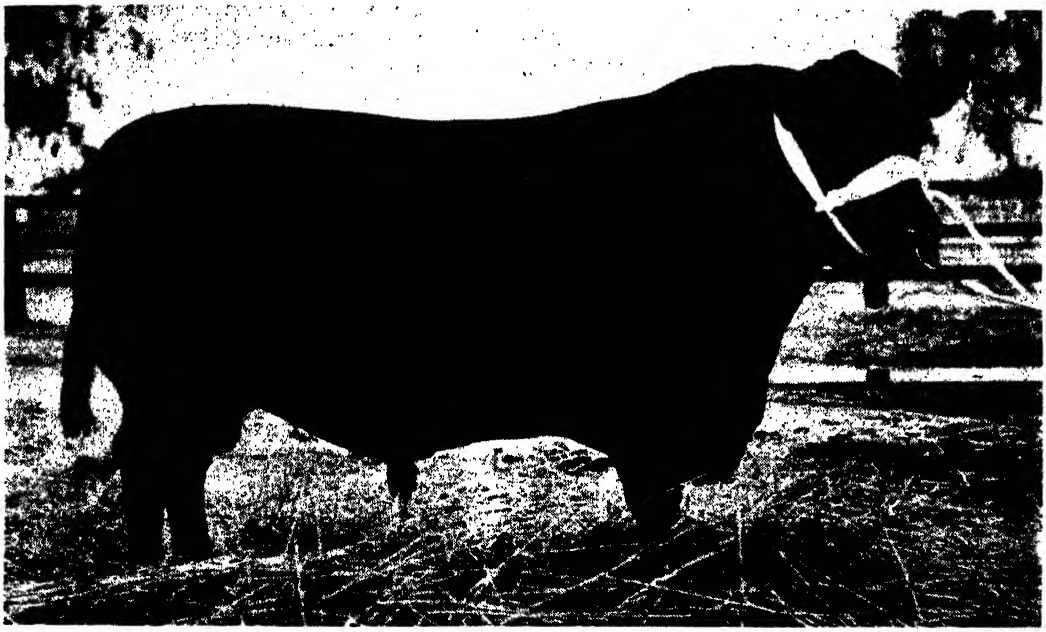
Giteris of Dalmeny.
This young bull, sired by Erison of Harviestoun, out of Gita 2nd, won the Supreme Championship at the Perth (Scotland) 1948 Show.

The champion was Giteris of Dalmeny, a son of Erison of Harviestoun, out of Gita 2nd, a heifer of the Earl's own breeding. Giteris, a year old is full of Geranium blood. This bull's successes were four-fold. As Supreme of the show, he annexed the Fordhouse Challenge Cup and the Aberdeen Angus Society's medal. Then he was adjudged senior champion to secure the Derculich cup, and as he was also adjudged the best bull not exceeding 2½ years bred by exhibitor, the breeders' championship challenge cup was added to his crop of honours.

On every occasion he was hotly challenged by the Perthshire-bred bull, Emor of Derculich, entered by Mr. R. Wemyss Honeyman from his Strathtay herd.

"Erison of Harviestoun" is at present head sire at Trangie Experiment Farm Aberdeen Angus Stud, and will be exhibited at the forthcoming Royal Sydney Show.

This bull's sire, "Janric of Dalmeny," had won First and Reserve Champion at Perth in 1943, and had also sired the 1945, 1946 and 1947 Champions at Perth. "Erison of Harviestoun's" dam was "Erissa of Harviestoun," regarded as one of the best Aberdeen Angus females ever seen at the Harviestoun Stud. Her sire "Jullan Eric" had also sired the Reserve Champion at Perth in 1942, and the Champion at Perth in 1944. "Jullan Eric," in turn, had been sired by the noted "Euripides of Bulfron."



Erison of Harviestoun at Trangie Experiment Farm. [*Photos by R. Meaker.*

The Dalmeny team of bulls at the Perth Show, this year, had been practically all sired by "Erison of Harviestoun," said Mr. Graham. This stud had replaced "Erison of Harviestoun," by the purchase of "Jarrah Eric of Derculich" (126872), one of the top-priced bulls at the 1947 Perth Show; and to ensure that the Department would benefit by this purchase, had mated the heifers at present en route to Australia to "Jarrah Eric of Derculich."

Visit the Department of Agriculture's Court at the Royal Show.

PREVENTION OF SPROUTING IN POTATOES.

Investigation in New South Wales.

A. C. ORMAN, H.D.A., Special Agronomist.

A CONSIDERABLE quantity of tableland potatoes is wasted each year as a result of sprouting in storage. The main crop is usually harvested during the period May to July and is available for market until about October, after which serious deterioration, with consequent wastage, occurs because of natural sprouting development. For this reason growers, merchants and consumers will be interested in experiments conducted by the Department with hormone treatments to retard sprouting.

To maintain the tubers in a satisfactory condition beyond October under present conditions necessitates cold storage, which, besides being relatively costly, is not available in sufficient capacity to meet the normal requirements of the potato industry. Surplus potatoes are now stored either by the grower in bags on the farm or by the potato merchants in large enclosed sheds. Because of the lack of cold storage facilities and the limitations of shed storage, main crop potatoes are seldom available for the market after October, with the result that there is usually a period between the end of the main crop and the commencement of deliveries from the early crop when potatoes are in short supply.

Because of these conditions the results of investigations with hormones for the prevention of sprouting in table potatoes, carried out in the United States of America recently, and the application of the results commercially in that country are of more than passing interest.

When this work first came under this Department's notice the possibilities of using hormones for retarding sprouting of potatoes and thus extending the marketing period were fully appreciated, and steps were immediately taken to initiate investigations in New South Wales. It was realised that, provided the hormone treatment was efficient and could be obtained and applied at a reasonable cost, growers, as well as distributors, would be able to store table potatoes effectively on the farm beyond the period now regarded as being the safe limit with shed storage.

It was therefore decided to carry out investigations at Batlow, Crookwell and Guyra with the chemical known as methyl ester of alpha naphthalene acetic acid and a proprietary sprout inhibitor called Barsprout, kindly supplied by Messrs. Buzacott Wolseley Pty. Ltd. who secured the material from American Cyanamid Coy., New York, U.S.A., for testing.

In the Batlow investigation both Barsprout and methyl ester were used, whereas at Crookwell and Guyra only Barsprout was tested. The results obtained are of considerable interest.

Results of Batlow Trial.

At Batlow fifteen bags of No. 1 grade tubers of the Factor variety, of the same origin and as uniform as possible in general characteristics, were treated as follows:

	Weight of Potatoes. 19/8/47. lb nett.	Weight of Potatoes. 14/11/47. lb. nett.
Bag 1 Check	140	131½
Bag 2 Check	137	129½
Bag 3 Department Agriculture dust	151	144½
Bag 4 Barsprout	134	127
Bag 5 Barsprout	146	138
Bag 6 Barsprout	136	129
Bag 7 Barsprout	135	128
Bag 8 Check	138	130
Bag 9 Check	141	133½
Bag 10 Check	146	138½
Bag 11 Check	132	126
Bag 12 Check	135	126½
Bag 13 Check	145	138
Bag 14 Check	145	138
Bag 15 Check	141	132

The potatoes appeared to be quite dormant at the time of treatment but carried more dirt than was considered desirable. Before treatment they were put over the grading table and all specimens showing injury were removed.

The Barsprout was applied to four bags as they were being filled, at the rate of 4 ozs. per bag; the makers recommend 1½ ozs.

per bushel. The Departmental dust was prepared by mixing 4 grammes of methyl ester of alpha naphthalene acetic acid with 2 lb. of kaolin; it was applied to one bag of potatoes as the bag was being filled. In all cases the dust was distributed as evenly as possible.

The reason for the large number of check bags in the test was to enable stacking to be carried out in something like a normal manner. After stacking the stack was covered with bagging.

Sprouting Retarded.

At an examination on 14th November each bag was weighed to determine the amount of shrinkage that had occurred during the intervening period. These weights are included in the accompanying table. It will be noted that the loss of weight in all bags was fairly uniform.

All the tubers in the untreated bags had developed long, spindly sprouts, some attaining a length of over 6 inches and the tubers were very withered and spongy to the feel. Generally speaking they were of little commercial value. No rotting or deterioration from other causes was noted.

The tubers treated with Barsprout, on the other hand, were in excellent commercial condition. Although some sprouting had taken place it had been considerably retarded. The condition of the tubers was crisp and they appeared to be almost as good as when first treated. Out of a total of 127 lb. of Barsprout-treated tubers in bagged form, 54 lb. had developed sprouts of ¼ inch and over, the remainder showing no signs of sprout development. Most of the sprouted tubers had developed only small sprouts and were in very good condition which indicated that the rate of sprouting had been impeded.

The potatoes treated with the Departmental preparation showed more evidence of sprouting than the Barsprout treatments, this being probably due to the uneven mixing of the chemical with the kaolin carrier. The amount of sprouting was much less, however, than the untreated tubers, which indicated the effectiveness of the chemical used. Of 144½ lb. of tubers treated with the Departmental preparation, 73 lb. of tubers had developed sprouts ¼-inch and over in length. The condition of these tubers was very satisfactory.

Potatoes after Storage from August to November.
Left.—Treated with Barsprout.
Right.—Untreated.

The temperature readings within the stack varied from 47 deg. Fahr. on 26th September, 1947, to 56 deg. Fahr. on 22nd September, 1947, the average temperature for the period being 50.09 deg. Fahr.

A further inspection of the tubers was made by represenatives of the Batlow Packing House on 2nd January, 1948, when it was noted that tubers in all the untreated bags had developed sprouts up to 15 inches long and were very withered and most unattractive. Only some of the treated tubers, on the other hand, had developed sprouts up to 3 inches long and even where this had occurred they remained firm and cut well. Two bags, one treated and one untreated, were weighed at the final inspection and it was found that whereas the loss in the treated bag from the time of the first inspection on the 19th August, 1947, to the 2nd January, 1948, was only 10 per cent., the loss for the untreated bag for the same

(*Continued on page 164.*)

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Taralga	March 9, 10
Tumbarumba (Mrs. Roy O'Shea)	March 9, 10
Tamworth	March 9, 10, 11
Cumnock (C. Reynolds)	March 10
Bingara	March 10, 11
Goulburn (Fergus Isaac)	March 11, 12, 13
Camden (G. V. Sidman)	March 11, 12, 13
Blayney (K. Gressor)	March 12, 13
Rylstone-Kandos	March 13
Quirindi	March 13, 14
Bulahdelah (C. Wilson)	March 19, 20
Sydney Royal	March 20 to 31
Gloucester (Mrs. M. A. Newton)	April 9, 10
Kempsey (A. Slack)	April 6, 7, 8
Binnaway	April 7
Macksville (D. Turner)	April 9, 10
Barraba	April 9, 10
Horsley (J. A. Siggers)	April 10
Bellingen (C. P. Franey)	April 12, 13
Coonabarabran	April 13, 14
Orange	April 13, 14, 15
Grafton (C. W. Creighton)	April 15, 16, 17
Gunnedah	April 15, 16, 17
Hawkesbury District (Clarendon) (T. J. Cambridge)	April 15, 16, 17
Boggabri	April 20, 21
Baradine	April 20, 21
Maclean (C. W. Done)	April 21, 22
Narrabri	April 23, 24
Urbenville (S. Stoddart)	April 23, 24
Dungog	April 30, May 1
Trangie	May 4, 5
Gilgandra (A. Christie)	May 18, 19
Sydney Sheep Show	June 2, 3, 4, 5
Cootamundra Sheep Show	June 22, 23
Wagga	August 24, 25, 26
Narrandera	September 10, 11
Cootamundra (D. H. Boyd)	October 15, 16

Approved Vegetable Seed—March, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Varieties Listed—continued.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, "Sherwood Farm," Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Hunter River Brown—R. C. Morandini, Box 74, Dubbo.

Crystal Grano—R. C. Morandini, Box 74, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

THE harvesting of many oat crops was seriously delayed, due to the upset caused by seasonal conditions. Oats are usually harvested before the wheat crop, but this season the oats harvest was delayed to such an extent that much of it had not been harvested by the time wheat crops matured and, in view of the high price in prospect, wheatgrowers preferred to strip their wheat at the expense of their oat crops. However, it is likely that the oat harvest will be a record one.

As with wheat, the quality of much of the grain harvested is low, while much of the hay harvested was of poor quality or has suffered considerable damage in the stooks.—DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS.

VITICULTURAL NOTES.

THE COMING VINTAGE.

Some Seasonal Reminders.

H. L. MANUEL, Viticultural Expert.

WITH the picking of grapes and wine-making operations now being undertaken, a reminder is given concerning some points to which it is essential that attention be given if best results are to be obtained.

Care of Picking Tins.

Picking tins should now be gone over in order to make sure that there are sufficient and that they are in good condition. Because both of their scarcity and the effect of a rusty condition on wine quality, the greatest care should be taken of them.

The life of tins can be considerably lengthened and the likelihood of the grapes contained in them giving the wine-maker trouble through the development of the "blue casse," due to an excess of iron resulting from rust particles, will be much reduced if the tins are given a periodical coat of good quality enamel paint. Galvanised iron trays or linings on lorries should be similarly treated. Not only is the reaction of the acid in the grapes on the zinc in the coating of the iron detrimental to wine quality as just explained, but the zinc compound formed is poisonous.

Attention to Casks and Hoses.

Where the grower is making his own wine, casks should be inspected and proper attention given to those needing coopering and cleaning. Suitable disinfectants are on the market, and can be used to advantage, not only during the preparation of the casks but throughout the vintage when washing down cellars and plant.

Particular attention should be given to the cleaning out of hoses, and for this purpose there is probably nothing better than grape spirit of 20 o.p. strength, with a little hydrochloric acid added. A certain amount of slime is deposited on the inside of a hose and it is very difficult to remove this by merely rinsing. The use of a long wire brush, in conjunction with whatever sterilising agent may be employed, is therefore advisable.

Pure Yeast Cultures This Season.

In a season such as the present, in which there has been much rain and a fair amount of disease in the vines, the use of pure yeast cultures is recommended.

Where special yeasts are used they should be ready working when vintage time arrives; special cultures can be obtained free of charge on application to the Department of Agriculture.

Cellar requisites (thermometer, saccharometer, etc.) and material should now be checked and examined. The small grower in particular may be reminded of the wisdom of using the thermometer in determining temperature, rather than depending on rule-of-thumb methods. It must not be forgotten that excessive temperatures in the the fermenting vats are the starting point of cellar trouble.

Importance of Cleanliness.

Cleanliness and the right cellar temperatures are the main factors in the successful manufacture of wine. Growers who deliver their grapes to proprietary wineries should make a practice—a daily one, if possible, and at the very least a weekly one—of thoroughly washing down their delivery waggons and scrubbing their picking tins, etc. Winery representatives should insist upon the maintenance of a satisfactory standard of cleanliness.

It is a good practice to cover the grapes on the delivery waggon with a clean sheet of tarpaulin so as to keep the fruit as free from road dust as possible; also, as far as practicable when picking to avoid allowing the grapes to stand in the heat.

(*Continued on page* 165.)

THE SOIL CONSERVATION (AMENDMENT) ACT, 1948

In Operation from 1st January.

MAIN PROVISIONS.

THE Soil Conservation (Amendment) Act, 1948, which is administered by the Department of Conservation, came into operation on 1st January, 1948. Many farmers will be interested in the operations under the Act. The following brief description of the main provisions has been supplied by the Secretary of the Department of Conservation.

Briefly, the Soil Conservation (Amendment) Act, 1948, provides machinery for:

1. The making of advances to landowners who desire financial aid to effect erosion control and soil conservation works on their properties.

2. The carrying out of "works," in respect of which advances may be made, by—

   (*a*) the landowner;

   (*b*) a private contractor;

   (*c*) The Minister for Conservation.

3. The hiring by the Minister for Conservation of plant to landholders for use on soil conservation works.

The amount of the advance, which may be up to 100 per cent. of the estimated cost of the works, will be determined by the Minister for Conservation, and moneys will be made available to landowners by the Rural Bank from funds provided by the Government.

The Rural Bank will also collect the repayments of the advance, together with interest at the prevailing rate, which will be determined in due course by the Colonial Treasurer. Provision is made for repayments to be spread over a period not exceeding fifteen years.

While a liberal interpretation will be given to the expression "works," such must involve some actual operation on the lands affected, such as contour furrowing, establishment of waterways, pasture improvement and the like. Such a practice as the retirement of a paddock from use would not be a "work."

It will be a condition of an advance that the landholder shall comply with such land-use practices as may be required of him by the Minister.

Officers of the Soil Conservation Service will give all possible help to landholders by way of advice, etc., but policy requires that benefiting landholders themselves shall bear the cost of those erosion control works which will result in their assets in their lands being maintained or enhanced.

A pamphlet is being prepared by the Department of Conservation, giving more detailed information, and copies of this publication will be available in due course.

In the meantime, inquirers seeking further information should contact the District Conservationists at Wagga Wagga, Orange, Goulburn, Scone, Tamworth and Inverell, or write to the Secretary, Department of Conservation, Box 4293, G.P.O., Sydney.

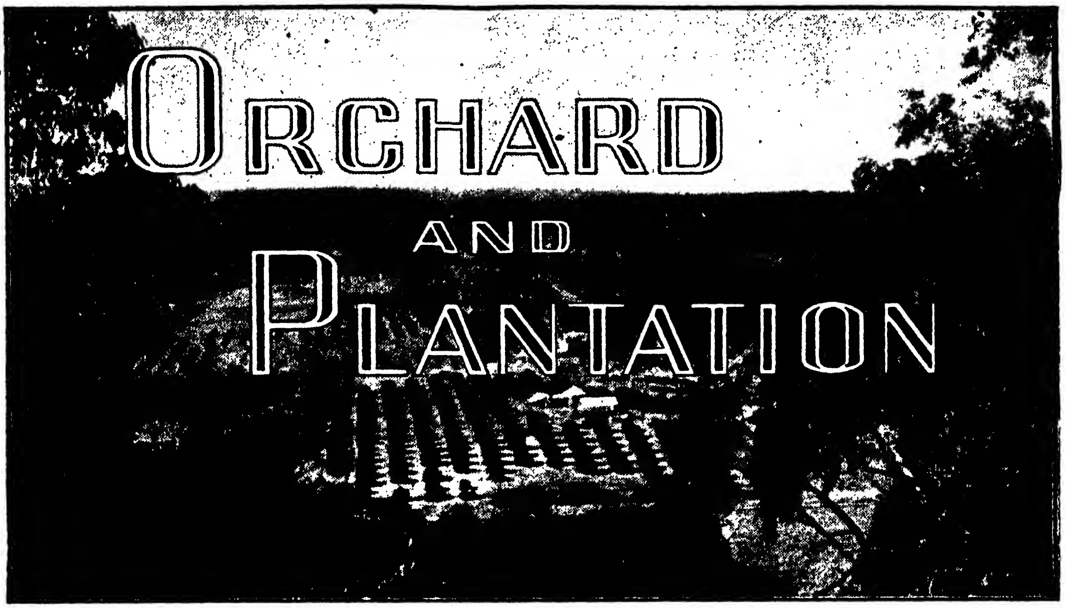
Heavy Infestation of Bronze Orange Bug at Gosford.

THERE has been an unusual infestation of the bronze orange bug in Gosford citrus orchards this season.

At West Gosford, the infestation was so heavy in one portion of an orchard that the young crop of fruit on large Navel trees was practically stripped by the bugs. Leaf-fall and leaf-spotting were also marked. So serious was this infestation that the whole orchard was sprayed with D.D.T. (0.1 per cent.).

Although small numbers of this pest have previously been noted at Gosford, major infestations have been confined to the North Coast.

Growers generally are warned of the potential seriousness of this pest. A vigorous attack should be made upon it, even when noticed in small numbers.—P. C. HELY, Entomologist.



ROTATIONAL HORTICULTURE

Is Essential to Permanency in the Industry.

(*Concluded from page 72.*)

B. OWEN FRENCH, B.Sc. Agr., H.D.A., Fruit Officer (Research).

IN many areas of the State the horticultural industry has reached the stage where it is faced with the necessity of re-using land previously planted to fruit trees and now reduced in fertility. To base consideration of the general principles of this problem on a practical example, the author is discussing, in this article, the case of growers on the Murrumbidgee Irrigation Area.

In the February issue he dealt with methods of preventing soil degeneration during the life of the trees, and this month discusses rotational horticulture in which the land is regenerated before replanting.

The Objectives of Rotational Horticulture.

The characteristics of a rotational system, and hence its effects on farm organisation and management are determined in the first place by the objective of the rotation.

In this instance at least, the prime objective is the restoration or maintenance of soil fertility, although ultimately this must be translated into terms of size and stability of farm income. For the individual farmer, the practices of soil fertility maintenance must pay-off in terms of higher and more stable incomes.

The importance of higher incomes needs no further comment here, but the factor of stability is not quite so clear-cut. The income to be derived from most agricultural pursuits usually fluctuates considerably from year to year, and to this extent an agricultural income is always unstable when compared with that to be derived from, say, a profession. However, it might be said that excluding violent price fluctuations, an agricultural income can be said to be stable if the potential production each year does not vary by more than that variation which would be due to seasonal influences.

As an illustration of this point, it would be possible to devise a cultural system which, while maintaining soil fertility, would result

in violent fluctuation in farm production, because there would not be a steady flow of regenerated land coming into production to replace the old land as it went out. Such a position would ultimately arise on an orchard where all available land was planted up with trees of the same age. The farm might go through, say, a thirty-year cycle made up as follows:—

(i) Ten years of low, although increasing, production during the establishment period.

(ii) Ten years of high production with mature trees at full productivity.

(iii) Five years of declining production as the trees become senile.

(iv) Five years of soil regeneration.

In circumstances such as these it is clear that each ten-year period of high production will be separated from the next by a fifteen-year period of relatively low production made up of the periods during which the trees decline in production, the soil regeneration period, and the re-establishment period. Clearly, the ironing out of these violent fluctuations should be a major objective in planning a rotation.

Partial Restoration May be Economic.

The importance of maintaining soil fertility is obvious to most people these days, but it is not always recognised that it may not be necessary or desirable to attempt to restore the soil to its full virgin fertility. It is conceivable that a sound system of permanent horticulture could be established at levels of soil fertility considerably below those of the virgin soils. The controlling factors would be economic, namely, the cost of production, the cost of soil regeneration, and the price of the product. If the extra production obtained by regenerating the soil to full virgin fertility would not leave a profit over and above the extra costs involved, then very obviously it would be poor farm management to persist.

Provided that no irreparable damage was done to the land, there is no reason why a system of farming maintained on a low level of soil fertility should be considered to be "bad farming." Such a system could only be condemned if it would lead to such a degree of soil deterioration that it would be virtually impossible to rebuild the land back to its virgin fertility level. The maintenance of a system of farming at a level of soil fertility somewhat below that of the virgin state need not necessarily result in the loss of the ultimate potentialities of the land.

Rotational Horticulture and Farm Management.

With soil fertility conservation and stability of farm income as main objectives, the characteristics of a horticultural rotation are determined by—

(i) The rate at which soil fertility declines.

(ii) The rate at which soil fertility can be rebuilt.

(iii) The total life of the tree.

(iv) The number of years required to bring a young tree into bearing.

Little, if anything, is known of the rate at which soil fertility declines under orchard conditions in New South Wales. The only point on which we have any guidance is the length of life of the tree, although even here, the possibility of a relation existing between soil fertility and the life of the tree would suggest that ideas on this matter may in time need to be revised.

The length of time likely to be involved in soil regeneration is equally obscure, and is, in consequence, in urgent need of investigation. However, as a basis for farm planning on the Murrumbidgee Irrigation Area a period of five years has become accepted as being a reasonable assumption until research proves otherwise.

The length of life of the tree crop is important from two aspects. First, the longer the life of the tree the greater will be the loss of soil fertility and the greater will be the task of soil regeneration. Secondly, the longer the life of the tree the smaller will be the proportion of the farmland which will need to be out of production and under soil regeneration treatment.

The Irrigation Research Extension Committee of the Murrumbidgee Irrigation Areas has tentatively adopted the ages shown in Table 4 as being applicable to Murrumbidgee Irrigation Area conditions.

TABLE 4.—TOTAL LIFE AND AGE TO BEARING FOR VARIOUS FRUIT CROPS ON THE MURRUMBIDGEE IRRIGATION AREA OF NEW SOUTH WALES.

Kind of Crop.	Total Life.	Bearing Life.	Age to Bearing.	Age to Bearing as Percentage of Total Life.
	Years.	Years.	Years.	Per cent.
Trees—				
Citrus	20	13	7	35
Peaches	20	14	6	30
Prunes	30	22	8	27
Pears	40	31	9	23
Apricots	25	19	6	24
Vines—				
Doradillo	20–25	16–21	4	16–20
Gordo Blanco ...				
Grenache				
Frontignac ...				
Other vines ...	50	46	4	8

Stabilisation of Production.

In order to stabilise the production from a particular area of land there must be a continual flow of young trees coming into bearing as the old trees decline; or in other words, a constant proportion of the total area must be maintained under non-bearing trees. The exact proportion is determined by the relationship between total life of tree and age to bearing. This might be made clearer by the following theoretical illustration.

If the total life of citrus trees is twenty years, then it might be assumed that area of land available for planting could be split into twenty parcels, one of which would be planted each year. Thus after the twentieth year the land would be fully planted up, and the first parcel planted would have ceased production and be ready for replanting by the commencement of the twenty-first year. If now the age-to-bearing is seven years, the proportion of land in non-bearing trees will be seven-twentieths of the total or 35 per cent. and the ratio between bearing and non-bearing trees is as thirteen is to seven.

The ratios of age to bearing to total life for various kinds of fruit on the M.I.A. are shown as percentages in Table 4. Using these figures it is possible to calculate the plantable area which must be available for the maintenance of a particular area of production.

If, for instance, it was desired to maintain 20 acres of productive citrus trees, the total area of the farm available for planting would need to approximate 31 acres, excluding the necessary allowance for headlands, roads, houseblock, etc.

Influence of Length of Tree Life.

The importance of the length of tree life can be seen from the fact that if the average life of the trees was twenty-five years, the proportion of land under non-bearing trees would fall to 28 per cent. and the total plantable area necessary to provide 20 acres of productive trees would be 28 acres.

Similar adjustments would be required if age to bearing was found to be different or could be altered. Table 5 shows how fluctuation in age to bearing and total life will affect the proportion of non-bearing trees required, and Table 6 gives the total plantable area necessary to be able to maintain 20 acres of productive trees.

TABLE 5—PROPORTION OF NON-BEARING TREES REQUIRED TO STABILISE FARM PRODUCTION UNDER VARIOUS ASSUMPTIONS AS TO TOTAL LIFE AND AGE TO BEARING.

Total Life of Trees.	Age to Bearing.			
	5 years.	6 years.	7 years.	8 years.
Years.	Per cent.	Per cent.	Per cent.	Per cent.
15	33	40	47	53
20	25	30	35	40
25	20	24	28	32
30	17	20	23	27
35	14	17	20	23

TABLE 6—TOTAL PLANTABLE AREA REQUIRED TO PROVIDE 20 ACRES OF PRODUCTIVE PLANTINGS UNDER VARIOUS ASSUMPTIONS AS TO TOTAL LIFE AND AGE TO BEARING.

Total Life of Trees.	Age to Bearing.			
	5 years.	6 years.	7 years.	8 years.
Years.	Acres.	Acres.	Acres.	Acres.
15	30	33	38	43
20	27	29	31	33
25	25	26	28	29
30	24	25	26	27
35	23	24	25	26

Estimates of this kind are not in any way fixed or rigid, even for a particular district or farm, but will vary according to the cultural treatment given the trees. Nevertheless, faced with the necessity for adopting a rotational system, it is obvious that we must make some assumptions on which to base our planning. Clearly these assumptions will always be of a tentative nature and will need to be revised in the light of further experience.

Allowance for Period of Soil Renovation.

In the calculations so far, the time involved in soil regeneration has not been

taken into account. To estimate, therefore, the proportion of land which will be out of production under the conditions of a stabilised rotation, it is necessary to add the length of time involved in soil regeneration to both the "age to bearing" and the "total life." Two new statistics are now derived, and might be called the "non-productive period" and the "rotation period."

The "non-productive period" thus represents "age to bearing" plus the "soil regeneration period" and the "rotation period" is the "total life of tree" plus the "soil regeneration period."

Following on the lines of Tables 5 and 6 the necessary calculations have been made to include a five-year soil regeneration period in Tables 7 and 8.

TABLE 7—PROPORTION OF FARM OUT OF PRODUCTION IN A STABILISED ROTATION FOR VARIOUS ASSUMPTIONS AS TO ROTATION PERIOD AND NON-PRODUCTIVE PERIOD.

Rotational Period.	Non-productive Period.			
	10 years.	11 years.	12 years.	13 years.
Years.	Per cent.	Per cent.	Per cent.	Per cent.
20	50	55	60	65
25	40	44	48	52
30	33	37	40	43
35	29	31	34	37
40	25	28	30	33

TABLE 8—TOTAL PLANTABLE AREA REQUIRED TO PROVIDE 20 ACRES OF PRODUCTIVE PLANTINGS IN A STABILISED ROTATION FOR VARIOUS ASSUMPTIONS AS TO ROTATIONAL PERIOD AND NON-PRODUCTIVE PERIOD.

Rotational Period.	Non-productive Period.			
	10 years.	11 years.	12 years.	13 years.
Years.	Acres.	Acres.	Acres.	Acres.
20	40	44	50	57
25	33	36	38	42
30	30	32	33	35
35	28	29	30	32
40	27	28	29	30

Referring back to Table 4, the total life of citrus trees under M.I.A. conditions is seen to be twenty years and the age to bearseven years. Assuming then a soil regeneration period of five years, the rotational period becomes twenty-five years, and the non-productive period twelve years. Reading from Table 8 it is seen that under these conditions a total plantable area of 38 acres would be required to maintain 20 acres of productive planting.

In the case of peaches 36 acres would be required to maintain 20 acres of productive trees; for prunes 35 acres and apricots 32 acres.

The Problem of Farm Size.

The principles of rotational horticulture thus draw attention to the problem of farm size, for these figures demonstrate that if the system is to be adopted, then a fairly large proportion of land must be maintained out of production and consequently total farm size is a matter of some concern.

Designing the Rotation.

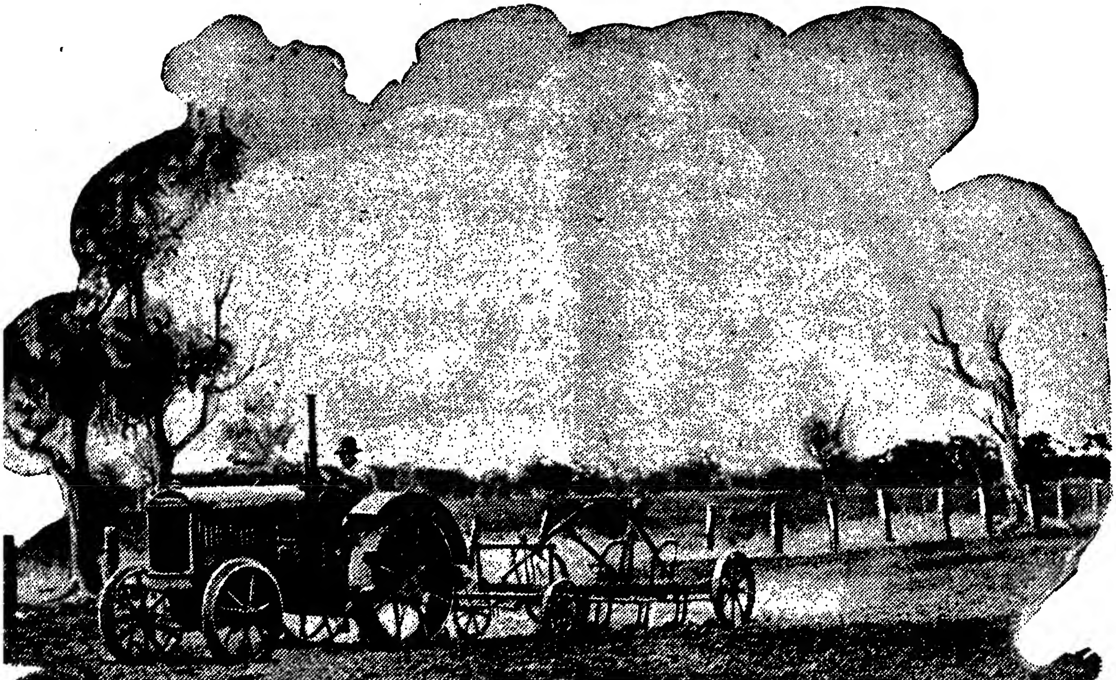
The simple arithmetic of these discussions might suggest that the design of a rotation is a relatively simple matter, but in actual practice it is complicated by the fact that, generally speaking, it would not be desirable to carry out an annual planting programme of two to three acres, because a farm would usually be divided naturally into a number of blocks of a larger size which would be handled most conveniently and efficiently as a single unit. Consequently the replanting programme would be more satisfactory if it could be planned on, say, a five-yearly basis.

Then, too, it is usually desirable, if not economically necessary, in the early development period of a farm, to bring a fairly large area of trees into production as quickly as possible. Under these circumstances a large proportion of the farm would be made up of trees of much the same age and which would consequently tend to decline together.

For purposes of illustration, let us assume that it is desired to maintain an area of 25 acres of productive citrus trees whose expected life is twenty years and age to bearing seven years. If it is further assumed that a soil regeneration period of five years is required, then the rotation period will be twenty-five years and the non-productive period twelve years.

From Table 8 we see that an area of 38 acres is required to maintain 20 acres of productive trees under these conditions, so that to maintain 25 acres of productive trees 48 acres of land will be required.

If it was desirable to carry out the planting and replanting programme on an annual basis, then all that would be necessary would be to plant 1/25th of 48 acres every year.



If the programme was designed on a five-year basis, then 5/25th of 48 acres would be planted every five years.

However, it is more likely that the original planting will be in the nature of the full 25 acres and the problem then is to find the most satisfactory method of swinging the farm on to a rotational system.

A Suggested Planting Programme.

The programme to be followed will differ according to conditions, but something after the style of the programme detailed in Table 9 might prove satisfactory. In this illustration the total farm area has been divided into six blocks (A) to (F) and three of these (A), (B) and (C) have been assumed to be planted in 1950. The table then illustrates what the programme might be for each block.

The problem will vary from crop to crop and according to local conditions and economic circumstances. There is, therefore, little point in determining a rigid mathematical solution. It is a matter for each farmer to formulate his programme according to the conditions as he sees them—not as a rigid plan but as something which can be changed as circumstances alter.

Rotation and Farm Costs.

From the point of view of farm accounting, the costs involved in soil regeneration are similar to costs of bringing the young trees into bearing, in that they are included

TABLE 9—A SUGGESTED PLANTING PROGRAMME TO ESTABLISH A ROTATION.

Year.	Non-bearing.	Bearing.	Not Planted.
September, 1950	Block A— 8 acres Block B— 8 acres Block C— 9 acres 25 acres planted	....	Block D— 8 acres. Block E— 8 acres. Block F— 7 acres. 23 acres.
September, 1960	Block D— 8 acres planted	Block A— 8 acres, 10 years Block B— 8 acres, 10 years Block C— 9 acres, 10 years 25 acres.	Block E— 8 acres. Block F— 7 acres. 15 acres.
September, 1965	Block D— 8 acres, 5 years Block E— 8 acres planted	Block A— 8 acres, 15 years Block B— 8 acres, 15 years Block C— 9 acres, 15 years 25 acres	Block F— 7 acres.
September, 1970	Block E— 8 acres, 5 years Block F— 7 acres planted	Block A— 8 acres, removed after crop. Block B— 8 acres, 20 years Block C— 9 acres, 20 years Block D— 8 acres, 10 years 25 acres	Block A— 8 acres.
September, 1975	Block F— 7 acres, 5 years Block A— 8 acres planted	Block B— 8 acres, removed after crop. Block C— 9 acres, 25 years Block D— 8 acres, 15 years Block E— 8 acres, 10 years 25 acres	Block B— 8 acres.
September, 1980	Block A— 8 acres, 5 years Block B— 8 acres planted	Block C— 9 acres, removed after crop. Block D— 8 acres, 20 years Block E— 8 acres, 15 years Block F— 7 acres, 10 years 23 acres	Block C— 9 acres.

in the capital cost of the tree and are consequently depreciated over its productive life.

However, the farmer is often more interested in the immediate cash outlay than long term profit or loss, and consequently day to day expenditures are usually offset by day to day receipts. As a factor in day to day expenses, the costs of soil regeneration would thus have to compete with such items of "productive" expenditure as fertiliser, spraying, and tillage of productive trees.

Furthermore, there will be a tendency to regard the soil regeneration programme as withholding a proportion of the land from production and thus reducing the income which "should" be available from the farm.

These problems could be minimised to some extent by using the soil regeneration programme as a basis for some sideline such as hay making, stock fattening, pig or poultry raising. Such a sideline might not only provide some immediate cash return but also actually assist the rebuilding of soil fertility.

Under some circumstances the non-bearing trees may be a large proportion of the productive trees and the costs of bringing them into production would thus represent a considerable item of expenditure.

The problem is essentially one of farm size and the ultimate solution lies in providing sufficiently large farms to permit an adequate income to be obtained from the productive portion after due allowance has been made for soil regeneration and the bringing of the young trees into bearing.

Rotational Horticulture and Land Settlement.

In many areas of the State, including the Murrumbidgee Irrigation Area, farmers are finding that it is virtually impossible to carry out a replanting programme because their farm size is too small. Usually a replanting programme involves the removal of old trees which, although well past their prime, nevertheless still manage to provide some return over annual costs of production. The orchardist is thus caught between the horns of a dilemma—on the one hand he is faced with a declining income because the trees are getting older and there are no young trees to replace them, and on the other he knows he will be financially embarrassed if present income is reduced by removing some of the productive trees and commencing a programme of replanting and soil regeneration.

This is a clear warning that in the settlement of new horticultural areas, farm size should be made sufficiently large to permit the adoption of a rotational system. In the implementation of such a policy the fundamental decision would be the productive area necessary to return a "home maintenance income." On this basis the size of farm required to maintain the necessary area of trees could be calculated. Generally speaking, it would seem advisable to work with figures of tree life, etc., somewhat lower than the average and to assume that extra long life, like extra high yields, should be a return for extraordinary farm management.

For the purposes of illustration a figure of 20 acres of productive trees has been taken for the calculation of Tables 6 and 8, but there is no basis for assuming that this represents a "home maintenance area" which in fact, would need to be determined for each district and crop.

The figures given in Table 8 show the area of plantable land necessary to maintain 20 acres of productive trees, but from the point of view of determining farm area these figures would need to be increased by 15 to 30 per cent. to allow for non-plantable areas such as house block, roads, headlands, irrigation ditches, etc.

There is much to be said for the agricultural philosophy of "a small farm well tilled"; but it would seem that our conception of a small farm needs to be enlarged if we are to bring about a conjunction of fertility maintenance with sound economics to establish a permanent system of horticultural farming.

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PLANT DISEASES.

BIG BUD (ROSETTE) OF TOMATOES AND OTHER PLANTS.

BIG bud of tomatoes is a virus disease which is commonly transmitted by the "leaf hopper" or jassid (*Thamnotettix argentata*)—a small grey insect with speckled wings, about ⅛-inch long.

In other countries other jassids have been shown to be capable of spreading the disease, and it is possible that more than the one species of this insect may act as a vector in Australia.

Distribution.

Big bud has been reported from all tomato growing areas in New South Wales, but it is seldom of commercial importance in the strictly coastal belt, although losses sometimes occur in the Windsor and Upper Hunter Valley districts. It is to the west of the Dividing Range that the trouble is most common and losses occur during seasons which favour the spread of the disease.

Big Bud of Tomato, showing Enlargement and Upright Habit of Buds.

Symptoms.

Big bud derives its name from its most characteristic symptom, namely the striking enlargement of the flower buds. The flowers are imperfectly formed, and it is rarely that the normal yellow pigment appears in the petals. The whole flower, which opens out only partially, develops the green colour of the leaves. In most cases

A Field Photograph of a "San Marzano" Tomato Plant, affected with Big Bud.

An Aster Plant Attacked by Big Bud.

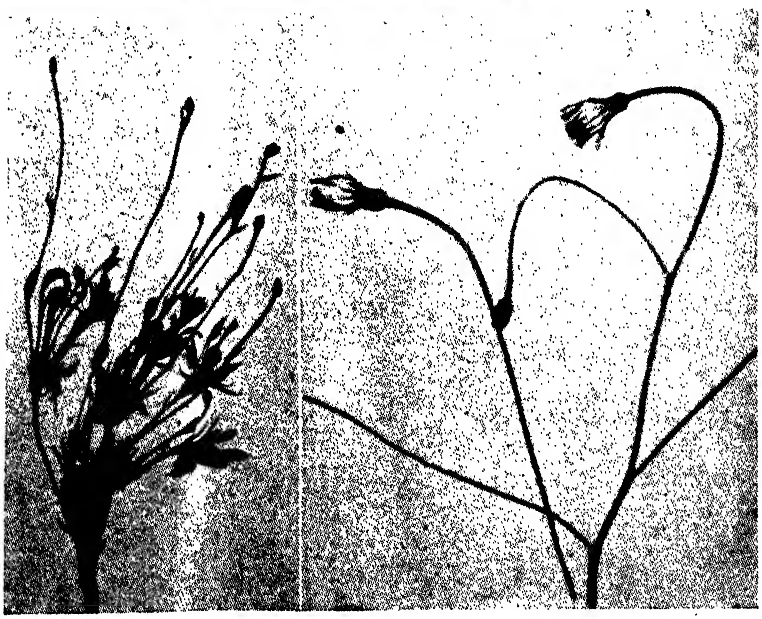
A Wild Gooseberry Plant Attacked by Big Bud.

Aster Flowers showing "Greening" due to the Big Bud Virus.

Thorn Apple Attacked by Big Bud Virus.

the flowering stalks, instead of bending downwards in the natural manner, remain erect, pointing upwards. The sepals often fail to separate, and because of the enlargement of the bud these structures bear only

Big Bud or Virescence of Phlox.
Note the healthy inflorescence on the right.

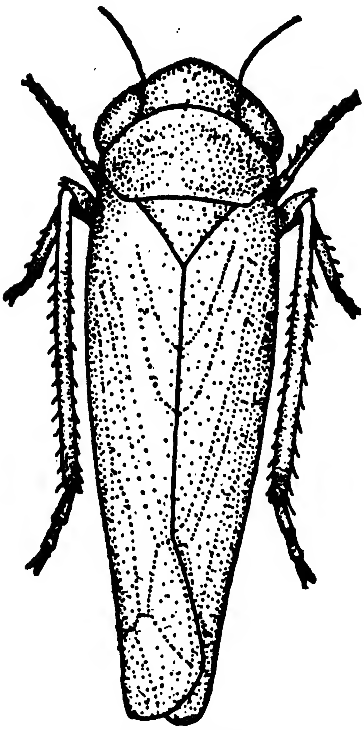


Big Bud of Catsear (*Hypochaeris radicata*).
Diseased plant on left; healthy plant on right.
[*After Hill.*

a superficial resemblance to a flower and are somewhat like a cape gooseberry fruit in its early stage of development.

Sometimes the leaf and flower stalks, though of thicker diameter than usual, elongate and give a somewhat spindly appearance to the plant. Often, however, these structures are shortened and their number is increased giving the plant a locally-stunted habit. This symptom is responsible for the alternate name "Rosette" which is commonly used in place of "Big bud."

Because of their extreme malformation, affected flowers fail to set fruit. Fruit formed before the plant becomes infected



A Leaf Hopper (Jassid).
The leaf hopper which transmits the big bud virus is about ⅛ inch in length.

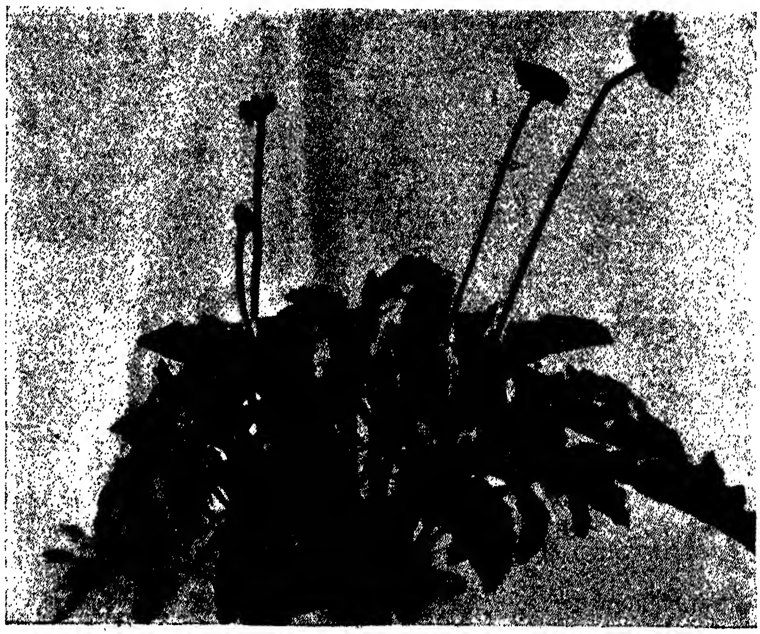
may develop a woody core and sometimes splits open.

Other Hosts.

The big bud virus is known to attack many species of plants. Many of these plants show symptoms which are different from those on the tomato, one outstanding difference being the absence of any enlargement of the buds. However, the greening of the floral parts is a constant characteristic and has led to the adoption of the term "virescence" instead of big bud, as the common name of the disease in such plants.

Many widely distributed weeds are attacked by the disease; these include crowfoot, dock, lamb's tongue, nightshade, spear thistle, sow thistle and thorn apple. Many ornamentals, fodder plants and vegetables are also affected, and among those which are naturally attacked by the virus are antirrhinum, aster, carnation, chrysanthemum, cornflower, dahlia, daphne, foxglove, gallardia, geranium, larkspur, marigold, nasturtium, petunia, phlox, shasta daisy, zinnia, clover (red and white), couch grass, Toowoomba canary grass, tobacco, beet, carrot, celery, eggplant, lettuce, parsley, parsnip and tomato. In many of the above, symptoms are restricted to the flowering

Big Bud of Gerbera.



head and are sometimes not readily observed.

Control.

Little experimental work has been done on the control of big bud, but in those cases where trouble is anticipated two lines of attack seem to be worthy of trial.

The disease is carried from an infected plant to a healthy one by jassids. Tomato and other crops grown from seed are free from disease at the outset. Therefore, if weeds are destroyed in the environment of a crop the chance of infected jassids invading the crop is diminished.

Jassids are known to be killed by D.D.T. and it is therefore possible that dusting field crops with a 1 per cent. D.D.T. dust would prove beneficial. The time of application of the dust would be important. It should be delayed until the insects are observed in the neighbourhood and should then be applied at intervals of about 10 days. Infection of crops most commonly occurs in October and November, and these would therefore seem to be the months best suited to a dusting programme.

Bordeaux Mixture Still First Choice.

DEPARTMENTAL Officers surveying the occurrence of plant diseases in various districts, have recently been concerned to hear that certain interested persons are defaming the value of home-made Bordeaux mixture as a spray for the control of fungous diseases of plants.

This Department agrees that certain forms of prepared copper sprays—particularly copper oxychloride—are of definite value as fungicidal sprays. However, it is definitely denied that any of these sprays supersede home-made Bordeaux mixture, and it is believed that, under a wide range of weather conditions, the home-made spray is superior to the others.

Farmers are advised to discount statements that "bluestone is now only half strength," and that the higher copper content of proprietary preparations is, in itself, a guarantee of better protection to the plant.

Stone lime and hydrated lime may be used in the preparation of Bordeaux mixture. Agricultural lime is useless. To test whether the bluestone has been effectively "killed," suspend a shiny nail in the mixture for two or three minutes. If the nail develops a coppery sheen, more lime is needed; otherwise the spray is safe for use.

A leaflet on the preparation of Bordeaux mixture is available from the Department of Agriculture, Box 36A, G.P.O., Sydney.

Quick Freeze Methods Investigated in Canada and U.S.A.

Mr. S. M. SYKES, Fruit Officer of the Department of Agriculture, who has been in America for the past nine months studying the latest developments in quick freezing methods of storing foodstuffs, has returned to Sydney.

In making this announcement, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., stated that during his sojourn in America Mr. Sykes had made a comprehensive survey of commercial freezing of fruits, vegetables, meat, poultry and fish.

Quick freezing was a well-established phase of food preservation in the United States of America and Canada, the Minister added. This method of preservation gave a very high-quality product.

The quick freezing of foodstuffs was gaining prominence in this State, said Mr. Graham, and the Government was anxious that problems associated with the process should be investigated on scientific lines.

In co-operation with the Council for Scientific and Industrial Research, the Department of Agriculture was undertaking research at the C.S.I.R. Food Preservation Laboratories, Homebush. Mr. Sykes would be the leader of the team of investigators. The knowledge he had acquired in America would be of inestimable benefit in undertaking the research work, which would prove of great benefit to the fruit and vegetable industries of the State.

Visit the Department of Agriculture's Court at the Royal Show.

FULLER'S ROSE WEEVIL

(*Pantomorus (Asynonychus) godmani* Crotch)

A Troublesome Pest of Citrus Trees.

P. C. HELY, B.Sc.Agr., H.D.A., Entomologist.

FULLER'S Rose Weevil (*Pantomorus (Asynonychus) godmani* Crotch) was first recorded in New South Wales by Gurney [3] in 1934, when specimens of the beetle were taken near Sydney feeding on Aspidistra. In 1937 [4] weevils were collected at Hornsby, and at Ourimbah, near Gosford, where severe injury was being caused to citrus trees by large numbers of these insects. Since that time the pest has spread over a large area of the central coast and can be found without difficulty in many citrus orchards, and in old weedy cultivation or headlands. So far the distribution of this beetle appears to be limited to the coastal districts of New South Wales and there appears to be no published record of its occurrence in the other States of the Commonwealth.

According to Razzauti [5] Fuller's Rose Weevil was first observed in the U.S.A. in 1879 and since that time has become a cosmopolitan pest. Buchanan [1] in 1939 stated that the original home was probably South America, and listed the following countries in which this beetle has been recorded:—U.S.A. (general, chiefly Sth. Atlantic States and California), southern Canada, Mexico, South America, Africa, Azores, Italy, France, Spain, Hawaii, Polynesia, Australia, (N.S.W). Since then Gourlay [2] has recorded its presence in New Zealand (Nelson, Auckland) during the years 1937-40.

Description of Adult.

The adult weevils are hard, rounded, greyish-brown beetles, about one-third inch long by three-sixteenths inch wide, with a short, broad rostrum, and usually show a faint white crescent-shaped mark on each side of the wing covers. Buchanan states: "*Pantomorus godmani* is easy to recognise by the marked concavity on the rostrum between the distinct latero-marginal carinae, the prominent, obliquely truncate supports on the mandibles, the long scape, the sublateral whitish patch on the elytron, and the absence of the erect setae on the disk, but their presence on the alternate intervals on the declivity of the elytron."

Life History.

Weevils emerge from pupae in the soil during midsummer, and the main emergence occurs from December to March. Sometimes earlier emergence occurs; this is dependent very largely on climatic conditions. When the summer months are dry very few beetles will emerge until good rains fall, and the main emergence may be delayed until February.

After hardening up, the beetles soon commence to feed, and about a month later become gravid and in a condition to lay eggs. No males of this insect are known and all individuals are capable of egg laying. Egg deposition usually commences in early March and may be continuous right up to May. Beetle feeding proceeds throughout the autumn, and though at a reduced rate. does not stop until cold frosty weather occurs. Some beetles hibernate throughout the winter and resume activity in September and may lay eggs in the spring. The bulk of the beetle population does not, however, carry through the winter.

The Eggs.

The eggs are creamy-yellow coloured, oval, and are deposited in masses, generally one layer in thickness, and each mass is surrounded by a fluid substance which sets very hard and cements the eggs to the surface on which they are deposited. Egg masses may be laid anywhere between two surfaces in contact, and have been found under stones, beneath loose bark, in curled dead leaves, beneath fruit buttons and between leaves or leaves and fruits where these are in contact. A favourite situation for egg laying is where spider webs have drawn leaves together, whilst in cages they readily deposit in cracks and around door joints. In one instance numbers of small cardboard labels attached to trees in the field

were cemented firmly to fruits and leaves by masses of eggs of these beetles.

Egg masses may contain from about fifteen up to over one hundred eggs, but generally the number ranges from twenty to thirty eggs per mass. Thirty-four egg masses counted showed a total of 890 eggs, averaging twenty-six eggs per mass.

The incubation period of the eggs during the early autumn ranged from thirty to fifty-seven days, whilst records taken in the spring showed an average period of thirty-eight days. Eggs deposited in late autumn take much longer to hatch and may carry through the winter unhatched. Whilst eggs are capable of remaining viable in very dry atmospheres, the presence of moisture greatly stimulates hatching when the eggs are fully incubated.

The Larvae.

When first hatched the larvae are very small, orange-coloured grubs, and though legless, are capable of rapid movement. They drop from the site of the egg mass and soon work their way down into the root zone where they commence to feed on the roots. In this early larval stage they are very resistant to adverse conditions, and have been apparently unaffected when held in dry tubes for up to ten days without food.

They feed on the surface of the roots by means of their strong jaws, and characteristically chew out small shallow sections of the surface tissue of the roots. Marked channelling of the roots does not occur, but sometimes the individual gnawed patches may run into each other and give the appearance of more or less continuous channelling. In addition to surface feeding on the larger roots, the larvae also chew through the fibre roots.

The length of the larval stage is probably somewhat variable, depending upon the time when the eggs hatch, and on climatic conditions. Records taken on potted orange seedlings have shown the period to be approximately 260 days, for larvae hatched in the autumn, and field evidence indicates that the majority of larvae hatched during the autumn emerge as adults during the following summer and early autumn. Larvae hatched in early autumn feed and grow rapidly at first, but their growth rate is slowed down considerably during the winter. Active feeding is resumed in the spring and development is accelerated during October-November. Late-autumn hatched grubs grow very slowly at first, but become increasingly active during late spring and summer.

Larvae are found mainly in the 6 to 8 inch root zone and have been found down to a depth of about 10 inches. Concentration of larvae is greatest in the zone beneath the spread of the branches, and tends to be greater towards the trunks of the trees. In one instance a careful search was made beneath a small Valencia tree which had been heavily infested by beetles during the previous autumn, and eleven larvae were found in a strip of soil 9 inches wide and 9 inches deep taken from just below the outside spread of the foliage in to the trunk. Assuming a similar concentration over the whole area beneath the tree, the total number of larvae was calculated at between 300 and 400. This estimate is probably conservative, as trees of this size may support populations of as many as 300 beetles, each capable of laying at least 200 eggs.

When fully-fed the larvae remain in a quiescent pre-pupal condition for some time, enclosed in a plain earthen cell, where they ultimately pupate. Insectary records of the length of the pupal stage varied from about seventeen days in December to twenty-four days in March, and this stage becomes increasingly lengthened during the colder season.

The Adults.

Adults, on first emerging, are soft and sluggish and mortality appears to be greatest in the pupae and newly emerged adult condition. Adults collected in early winter have been kept alive for a little over five months, but the average life under similar conditions is about two and a half to three months. After egg deposition has commenced the expectancy of life in these weevils is greatly reduced, and it is probable that most over-wintering adults have not deposited eggs during the autumn. Records indicate that the total number of eggs laid per beetle is very variable, but the average number appears to be in the vicinity of 200 eggs laid in about eight separate batches.

Host Plants.

In the adult stage this beetle is an omnivorous feeder on vegetation, and there appear to be very few plants upon which

it will not feed. Though there seems some tendency for the newly-emerged beetles to eat the more tender and succulent plant parts, the older weevils have a preference for tougher, fibrous tissues.

The actual host range listed in different countries is very extensive, but the following list includes the common plants on which Fuller's Rose Weevils have been seen here feeding with apparent avidity:—

Citrus (all varieties), Fat Hen (*Chenopodium* spp.), Paddy's Lucerne (*Sida* spp.), Purple Top (*Verbena* sp.), passion vine, banana passion, blackberry, camellia, gardenia, hydrangea, camphor laurel, French bean, *Bidens* sp., peach, rose, plum, dahlia, sapote. They have also been seen feeding slightly on *Pinus radiata* and on *Eucalyptus* sp.

Amongst the hosts listed several common weeds, especially Fat Hen and Paddy's Lucerne, are very eagerly fed on by these beetles, and these weeds represent a reservoir from which large numbers of weevils may re-infest clean orchards. Larval development can probably occur on many of the host plants listed, but larvae have been bred in the insectary or taken in the field on citrus, blackberry, Fat Hen, Paddy's Lucerne and French bean.

Injury.

Beetle injury on citrus and similar fibrous-leaved plants is very characteristic and not likely to be confused with that caused by any other pest. The weevils chew out large pieces round the margins of the leaves, giving them a ragged, saw-toothed appearance. Sometimes the greater part of the leaf is chewed away, leaving only portion of the mid-vein and the leaf stalk, which may also be nibbled. Generally the twig is not injured, though occasionally some bark injury may be seen. Young shoots may be nipped off and buds may be gnawed, and in one instance, early-hatched beetles in December were seen to strip completely the young soft shoots from individual large branches on lemon trees which had been skeleton pruned in the late spring. No fruit injury caused by these weevils has been seen on either mature or small green fruits, though Razzauti in Italy recorded them boring into the young fruits at their point of attachment, causing them to wither.

Root injury to citrus trees by the larvae is somewhat indefinite, and may consist of some gnawing of the bark of the older roots, causing localized formation of shallow pits or depressions, and these may extend to a partial stripping of the bark from some individual root sections. Most of the injury, however, appears to consist in the nipping off and destruction of fibre root, and when rearing larvae on potted trees it is common to find much loose fibre root which has

Citrus Foliage Damaged by Fuller's Rose Weevil.
[*Photo by A. H. Friend.*

apparently been so attacked. Examinations of the dissected gut contents of larvae feeding on citrus roots commonly show pieces of undigested tracheal conducting tissue obviously from roots of small diameter, indicating clearly that such roots have been chewed at least half way through.

In the field positive evidence of injury is often difficult to find and very little pitting or gouging of the roots may be seen. Paucity of root fibre is, however, a common feature of infestation by Fuller's Rose Weevil larvae, and characteristically roots of such infested trees are often long ropes almost completely devoid of fibre along their lengths, and with tufts of fibrous roots at the extremities.

On French beans the larvae feed in much the same way as on citrus, chewing off the fibrous roots, but in addition furrow the main roots by gnawing shallow pits in close proximity to each other. Such injury in one spring crop of beans sown in land which had supported a heavy growth of Paddy's Lucerne until well into the winter, was sufficiently severe to kill out or seriously stunt portions of the crop.

Economic Importance.

Foliage injury by the adult weevils may in some instances have a severe checking effect on the development of affected trees, but usually the damage is not very serious. Beetles mostly attack the lower foliage up to 3 to 4 feet from the ground, and though unsightly, the injury is probably not greatly disadvantageous to the trees. Replant trees in old orchards, reworked trees, or trees rejuvenated by skeleton pruning, may, however, suffer a considerable developmental check, as such trees are often selected by the beetles for specially heavy attack. As already mentioned, late-pruned trees may have the young shoots completely stripped from individual limbs, and this causes a definite set-back to the trees.

The importance of larval damage, even to heavily infested trees, is very difficult to assess, as no strongly marked alteration in the appearance of affected trees is seen. There is some tendency for the trees to thin out and lose vigour, but this effect is gradual and often complicated by other factors. Well-tended trees appear to be able to support quite large larval infestations for several years without very serious ill effects, though under similar infestation conditions poorly-cared-for trees lose vigour more rapidly.

Fibrous root development is most abundant during late spring, summer and early autumn months, and at this time most of the larvae will be in the pre-pupal and pupal conditions, or else the new season's larvae will be very small. It would seem, therefore, that citrus trees do have an opportunity to make a good fibrous root growth during the time when larvae are least active, and may so be able to compensate for the root losses suffered during the remaining months of the year.

Method of Spread.

The rapidity with which this insect has been distributed within the central coastal area, though remarkable, is easily appreciated when certain features of its habits and life history are considered. In the adult stage the beetles are inconspicuous, very hard, and cling readily to any object, and though incapable of flight may easily be transferred from place to place on vehicles of all types, and on man. Being capable of long starvation periods, they survive unfavourable conditions very well, and in any case have such a wide range of food plants that in any situation where vegetation is present they are almost certainly capable of survival. Occurring as they do in orchards, on both trees and in weed growth, they have ample opportunity to be transported from place to place on vehicles and in field cases from orchard to packing shed, and from these central situations may easily be carried in empty field cases to other orchards.

Not only can the adults be readily spread in this manner, but also egg masses may be easily transported by the same means. Fruits gathered in the orchard often have egg masses glued to the skin and these may become dislodged and fall into crevices in the boxes. Eggs may be deposited directly by the beetles in cracks and corners in the boxes, especially when these are stacked in the field. By the time such eggs hatch, the boxes may have been transported over a very wide area. Hatched grubs from such eggs can survive several days before finally having the chance to enter the soil. When they do finally reach the soil there is always a high probability that suitable plants for the larvae to feed on will be available, as their host-range is so wide.

Effect of Climate on Fuller's Rose Weevil.

The climatic range of this insect, as judged by its geographic distribution, appears to be wide, though it would seem that temperate to subtropical conditions are the most suitable. Cold winter seasons are not favourable to best development in the field, though these insects commonly overwinter in both the egg and adult stage in protected domestic situations in buildings, glasshouses and in rubbish.

High atmospheric temperatures do not affect either larvae or adults unduly, and live gravid weevils were seen commonly in January, 1939, following temperatures up to 117 deg. Fahr., which were high enough to induce widespread mortality in many other citrus pests in the Gosford district.

Control.

Clean cultivation in orchards is suggested as being of importance in control of this insect, and Woglum [6] states that following the practice of allowing weed growth to occur in citrus orchards an increase in infestation by this weevil has occurred in recent years in California.

Whilst this has been observed to some extent in this State also, infestations may occur quite commonly in clean cultivated orchards. The weevils have even been seen to cause considerable injury in orchards where weed control has been effected by chemical weed sprays, and in blocks in which fowls have run amongst the trees for some time.

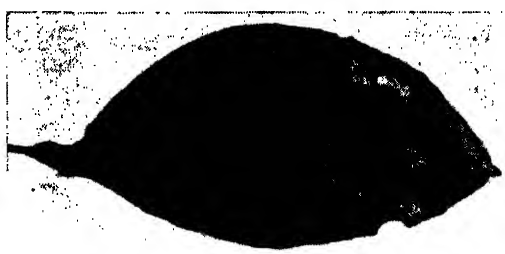
Direct methods of control by spraying with cryolite at the rate of 1¼ lb. to 40 gals., or with D.D.T. emulsions have been successful; lead arsenate sprays have been of little value. Derris preparations are fairly effective, but pyrethrum sprays merely stun the beetles which later recover.

To be effective, sprays must be applied when weevils are first observed causing injury to the trees, which is usually in early January or late December. As the adults remain for about a month before depositing eggs it is desirable to kill as many insects as possible before they become gravid.

Sprays containing D.D.T. at a concentration of as low as 0.5 per cent. are very toxic and have a considerable residual effect against Rose Weevil. They may, if required, be combined in routine oil* or Bordeaux sprays which may be applied at that time. Re-infestation of sprayed trees may occur from weevils feeding on susceptible weed plants in the orchard, and it is desirable to remove these by cultivation or weed spray, and concentrate the weevils on the trees prior to applying the spray.

Since the weevils cannot fly, trees can be easily protected by banding them with sticky tree tanglefoot bands, but it is necessary to remove all low-hanging branches, and to destroy weeds growing beneath the trees before putting on the bands. The banding method is particularly suited to young trees and to skeleton-pruned trees, but it is advisable first to put on a strip of bituminous grafting paint around the trunk and, when this is dry, to apply the tanglefoot on top of the paint layer so as to avoid the possibility of injury to the bark where the trunks are exposed to the sun.

No satisfactory method of controlling the larvae in the soil has yet been demonstrated, but where these are known to be present, much can be done to counteract the effects of their feeding on the roots by encouraging the development of root fibre by such horticultural practices as the use of sheep manure or other animal manures, irrigation, and perhaps skeleton pruning to rehabilitate trees which have reached a stagnant condition of



Egg Masses of Fuller's Rose Weevil on Leaf.

growth. The planned use of fowls in citrus orchards will also greatly improve fibrous root production, but as fowls do not usually eliminate weeds such as Fat Hen, Paddy's Lucerne and Purple Top upon which Rose Weevils feed and breed readily, there is little likelihood of poultry completely eliminating these insects from the orchard, though they undoubtedly keep them in satisfactory subjection.

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* Thorough spraying with D.D.T. sprays at this period may stimulate the development of Rust Mite (*Phyllocoptruta oleivorus*) infestations on citrus trees.

INSECT PESTS.

Notes contributed by the Entomological branch.

The Powder-post Beetle.

(Lyctus brunneus).

THE powder-post beetles belong to the family *Lyctidae,* and probably the most frequently observed species is *Lyctus brunneus,* a cosmopolitan pest.

The larvae or grubs of the powder-post beetle attack the sapwood of various pored timbers, usually hardwoods and brushwoods. The larvae will continue to infest the sapwood, if it is suitable, until it is all destroyed, but they do not enter the true wood. Non-pored timbers, such as pines, are immune from attack.

The tunnels run more or less parallel to the grain of the wood, and the frass is packed tightly in the tunnels. This may be ejected from the flight-holes of the adult beetles or from cracks, as a flour-like powder.

The damage to hardwoods, used for constructional purposes, is generally not serious, as the powdering of a narrow strip of sapwood on one side or edge does not seriously weaken a beam. Damage to furniture or internal fittings, however, may be much more serious. Green timber is not attacked, but after two or three weeks, sufficient drying has taken place to allow the larvae to develop. Usually the timber is attacked after it has been sawn or during the first year or two in use.

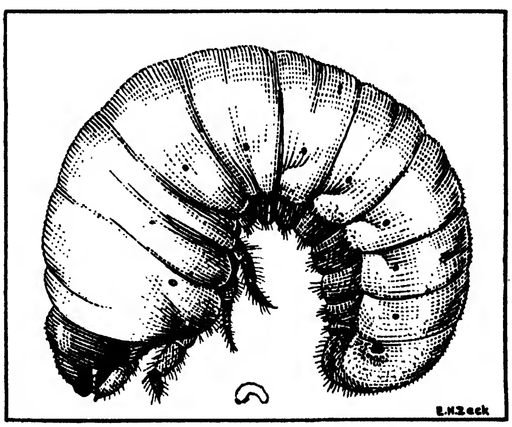
The eggs are laid in the pores of the timber, and where pores are absent, very small, or filled with wax, the eggs cannot be laid in the timber and the timbers are immune. The eggs hatch in from eight to twenty-five days.

The body of the larva is whitish, and it does not possess the rows of spines on the upper surface which are characteristic of the common furniture beetle, *Anobium punctatum.* The front legs are much thicker than the other two pairs, and the last breathing pore or spiracle, at the end of the abdomen, is much larger than the others. When fully fed the larva bores its way towards the outside of the sapwood, and there, in a small cell at the end of its tunnel, enters its pupal stage.

The adult is narrow-bodied, flattened and of variable size. It may measure from one-eighth to one-fifth of an inch in length, and vary in colour from reddish-brown to dark brown. The adults can fly readily and are more active at night. The only boring done by the adults is when gnawing their flight-holes or exit-holes in the wood.

The larvae are responsible for the boring and destruction of the sapwood, and starch constitutes their main food.

Where eggs are laid in the spring or early summer, the beetles may emerge in late summer or autumn and the life-cycle from egg to adult may be as short as three months. Various factors, such as climatic conditions, nature of the timber infested, and



Larva of the Powder-post Beetle.

the starch concentration in the timber, influence the length of the life-cycle.

Control.

Various methods are adopted to prevent attack after cutting. These include the removal of susceptible sapwood, and the destruction, by burning, of pieces or strips of sapwood lying about yards, as these may serve as breeding material for the beetles. The impregnation of green timber with boric acid solution is an accepted method for the treatment of veneers.

It is difficult to determine the limits of the sapwood in scrubwood and brushwood timbers, and in young trees it may extend to the pith. Although the sapwood may be obvious, it may not be susceptible to attack, as many species of trees are lacking in starch. Testing solutions are used to indicate the presence of starch.

Amongst the methods tested for the resorption of starch in the timber have been high ringing of the trees several months before felling, storage of logs in the round and storage in fresh water.

Coal-tar creosote or creosote oil is commonly used for the control of borers, and thorough treatment of timbers with this oil will usually prevent the beetles from laying their eggs on, and re-infesting the timber, and will also kill any larvae or pupae it may reach near the surface. The oil should first be applied during the early spring months prior to the hatching of the beetles.

Creosote oil produces a dark brown stain and affects the painting or staining of the wood. The density of the stain may be reduced by mixing the creosote with an equal quantity, or more, of kerosene. This, however, renders the creosote less effective.

Where staining is not desirable, either a mixture containing vegetable turpentine (9 fluid oz.) and kerosene (1 fluid oz.), to which may be added paradichlorobenzene (½ oz.); or a solution of paradichlorobenzene (1 oz.) in kerosene (½ pint) are used. Solutions containing orthodichlorobenzene are also used. Mixtures containing equal quantities of turpentine and kerosene are sometimes used for small articles and furniture, where the infestation is of limited extent. These solutions, however, are not as lasting in their effects and more frequent applications are necessary.

Small articles may be treated by brushing on the solution and allowing it to penetrate into the exit holes, or it may be injected into the holes by means of a fine-pointed syringe. If a power syringe is used, sufficient pressure may be exerted to force the solution deep into the timber and through the tunnels in the wood.

Oils containing pentachlorphenol in solution are now being used in various countries for control of borers, and these afford more permanent protection against their attacks, whether the timbers are indoors or exposed to the weather.

Light oils containing copper naphthenate, which are bright green in colour, and oils containing zinc naphthenate, which are colourless, have been widely used with good results. The zinc naphthenate, however, is not considered to be as effective as the former.

After treatment the flight holes may be filled with a suitable coloured filler, and this will enable any new emergence holes to be detected readily.

Whatever substance is used, every effort should be made to obtain the greatest possible degree of penetration. It must be remembered that repeated treatments throughout the season may be necessary, as any one treatment with chemicals may not give complete control.

If timber is extensively damaged, its replacement may be preferable to any chemical treatment.

Where infestation is suspected in logs or sawn timber before seasoning, any damage may be halted by kiln drying. Seasoned timber, also, can be treated. The temperatures and humidities necessary, and the length of treatment required, vary with the amount of seasoning that has taken place and the thickness of the timber. Heat treatment, however, will not make the timber immune from later attacks.

Vacuum fumigation may be recommended for the control of borers in valuable articles or pieces of furniture.

Susceptibility of Timbers.

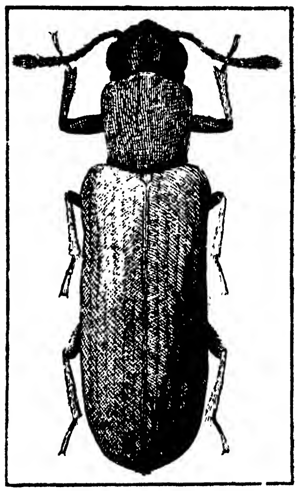
The Division of Wood Technology, Forestry Commission of N.S.W., has listed* the degree of susceptibility of the following

* Roneoed Typescript, April, 1946.

Australian timbers to attack by *Lyctus* beetles.

VERY SUSCEPTIBLE TIMBERS.

Acacia bakeri (White marblewood), *A. dealbata* (Silver wattle), *A. maideni* (Maiden's wattle), *Ailanthus imberbiflora*, and *A. malabarica* (White siris), *Albizzia toona* (Red siris), *Aleurites moluccana* (Candlenut), *Alstonia scholaris* (White cheesewood), *Angophora bakeri* (Narrow-leaved apple), *A. cordifolia* (Dwarf apple), *A. costata* (Smooth-barked apple), *A. intermedia* (Rough-barked apple), *A. lanceolata* (Smooth-barked apple), *A. subvelutina* (Broad-leaved apple), *Aphananthe philippinensis* (Grey Handlewood), *Atalaya hemiglauca* (Whitewood), *A. multiflora* (White teak), *Beilschmiedia bancroftii* (Yellow walnut), *Blepharocarya involucrigera* (Rose butter-nut), *Bursera australasica* (Brown cudgerie), *Cadellia pentastylis* (Red plum), *Cardwellia sublimis* (Northern silky oak), *Castanospermum australe* (Black bean), *Cedrela toona* (Red cedar), *Celtis paniculata* (Tripe wood), *Cinnamomum laubatii* (Pepperwood), *C. oliveri* and *C. virens* (Camphorwood), *C. nummatamala* (Pepperwood), *Cryptocarya erythroxylon* and *C. patentinervis* (Rose maple), *Diospyros pentamera* (Grey persimmon), *Diploglottis cunninghamii* (Tamarind), *Dysoxylum fraseranum* (Rose mahogany), *D. muelleri* (Miva mahogany), *Embothrium wickhamii* (Satin oak), *Erythrina vespertilio* (Grey corkwood), *Eucalyptus aggregata* (Black gum), *E. angophoroides* (Apple-top gum), *E. australiana* (Narrow-leaved peppermint), *E. bancroftii* (Forest red gum), *E. bicostata* (Southern blue, gum); *E. bridgesiana* (But but), *E. cinerea* (Mealy stringybark), *E. citriodora* (Spotted gum), *E. cladocalyx* (Sugar gum), *E. dunnii* (White gum), *E. elaeophora* (Long-leaved box), *E. eximia* (Yellow bloodwood), *E. kirtoniana* (Red mahogany), *E. maculata* (Spotted gum), *E. maideni* (Maiden's gum), *E. obliqua* (Messmate stringybark), *E. ovata* (Swamp gum), *E. sideroxylon* (Red ironbark), *E. stellulata* (Black sallee), *E. tessellaris* (Carabeen), E. *trachyphloia* (Brown bloodwood), *E. viminalis* (Manna gum), *Euroschinus falcatus* (Pink poplar), *Ficus macrophylla* (Moreton Bay fig), *F. rubiginosa* (Port Jackson fig), *Flindersia australis* (Crow's ash), *Geijera salicifolia* (Green satinheart), *Geissois lachnocarpa* (Mararie), *Grevillea robusta* (Southern silky oak), *Hakea vittata* (Striped hakea), *Heterodendron oleaefolium* (Cattlebush), *Litsea reticulata* (Bollywood), *Lucuma galacloxylon* (Red silkwood), *Macadamia ternifolia* (Australian nut), *Panax elegans* (Silver basswood), *Pithecolobium hendersoni* (Tortoise-shell tulip), *P. pruinosum* (Marblewood), *Pleiogynium solandri* (Tulip plum), *Psuedomorus brunoniana* (White handlewood), *Rhodosphaera rhodanthema* (Tulip satinwood), *Sarcocephalus cordatus* (Cheesewood), *Schizomeria ovata* (White birch), *Sideroxylon pohlmanianum* (Yellow boxwood), *Siphonodon australe* (Ivorywood), *Sloanea australis* (Blush alder), *S. woollsii* (Yellow carabeen), *Stenocarpus salignus* (Red silky oak), *Sterculia acerifolia* (Flame kurrajong), *S. discolor* (White kurrajong), *Synoum glandulosum* (Red sycamore),



Adult of the Powder-post Beetle.

Tarrietia actinophylla (Blush tulip oak), *T. argyrodendron* (Brown tulip oak), *T. peralata* (Red tulip oak), *Xanthophyllum macintyrii* (False saffron heart), and *Xylomelum pyriforme* (Native pear).

TIMBERS THAT ARE IMMUNE.

Ackama australiensis (Rose alder), *Atherosperma moschatum* (Southern sassafras), *Ceratopetalum succirubrum* (Satin sycamore), *Cryptocarya glaucescens* (Silver sycamore), *Daphnandra aromatica* (Northern sassafras), *D. micrantha* (Sassafras),

Doryphora sassafras (Sassafras), *Eucalyptus melanophloia* (Silver-leaved ironbark), *Eugenia smithii* (Lilly pilly), *Syncarpia hillii* (Satinay), *S. laurifolia* (Turpentine), *S. leptopetala* (Brush turpentine), *Tristania conferta* (Brushbox), *Vitex lignum-vitae* (Yellow hollywood), and *Xanthostemon oppositifolius* (Southern penda).

There are many timbers in which the sapwood is practically immune from attack and numbers of others that are considered to be susceptible to attack.

EXOTIC TIMBERS.

Amongst other timbers that may be attacked by *Lyctus*, the following have been recorded:—*Azaderachla integrifolia*, *Calophyllum* sp. (Island cedar), *Carya tomentosa* (American hickory), *Cinnamomum camphora* (Camphor laurel), *Fraxinus* sp. (Japanese ash), *Ochroma* sp. (Balsa wood), *Pentacome* sp. (White Pacific maple), *Quercus* sp. (Japanese or Pacific oak), *Salix* sp. (Willow), *Sarcocephalus cordatus* (Cheesewood or Canarywood), *Shorea* spp. (Borneo cedar and Red Pacific maple).

Timber Marketing Act Requirements.

The Timber Marketing Act of New South Wales now provides for the control of the sale and use of certain timbers likely to be infested with, or susceptible to infestation by *Lyctus* beetles, and the use of approved preventive treatments.

D.D.T. Danger to Fish.

IN the Insect Pest Notes of the December, 1947, issue of this *Gazette*, a note was published concerning the accidental contamination of a small dam with a quantity of waste 0.1 per cent. D.D.T. spray. Overnight, fish and crayfish were killed in large numbers even at the low estimated concentration of 1 part D.D.T. in 25,000,000 parts of water.

This suggested a possible method of control for crayfish, which can cause considerable damage to the banks of irrigation canals. However, the possibility of D.D.T.-contamination of streams, with subsequent destruction of fish, must be considered, and it is desired to issue a warning to landholders against any indiscrimate use of D.D.T. It is unlikely that orchard spray vats would be emptied directly into dams or streams as a routine procedure, but this practice should be avoided.

Gross contamination of streams, with danger to fish-life, would only be likely to occur if widespread mosquito control campaigns were carried out, but these are not taking place at the present time. The danger to fish-life was carefully considered during the malaria control campaigns undertaken in the south-west Pacific area, and the routine use of 5 per cent. D.D.T.-kerosene mixture was considered, and found to be safe.

Other formulations of D.D.T. are now readily available, and types which mix with water are more likely to be toxic and must be used with caution if fish-life is to be safeguarded.

Good Control of Irish Blight of Potatoes by Dusting.

A TRIAL carried out on the property of a Dorrigo landowner has indicated that treatment of potato plants with fungicidal dusts is a payable proposition in seasons when severe outbreaks of "late" or "Irish" blight are likely to occur.

In this trial potato plants were dusted seven times at intervals of approximately eight days, with a copper-lime dust containing 25 per cent. monohydrated copper sulphate.

Although every plant in the crop was affected by the disease, there was three or four times as much green leaf tissue on the dusted plants as on the untreated ones.

Tubers from the treated plants were larger in size and less affected with rot than those from the undusted plants.

The treated plants yielded 33 bags of tubers, as against 25 bags from the undusted plants—an increase of 32 per cent. by weight as a result of dusting.—BIOLOGICAL BRANCH.

APIARY NOTES

GOOD BUD DEVELOPMENT FOR NEXT SEASON'S FLOWERING.

●

W. A. GOODACRE, Special Livestock Officer (Apiculture).

WITH a wide variety of eucalypts showing good bud-development for next season's flowering, commencing about September, all bee-farmers will be encouraged to get their colonies of bees into the best condition for wintering, and the time is now opportune for a commencement of this work. Success depends mainly on building up a good force of young vigorous bees for winter, and on ensuring later that the colonies have an ample supply of good honey stores and comfortable winter quarters within the hives.

Re-queening.

To secure this force of young bees, every effort should be made to re-queen any colonies now containing queens upwards of two years of age, with the exception, of course, of the few specials it is desired to hold for breeding purposes.

These autumn months are particularly good for introduction of queen bees, whether purchased from bee-breeding stations or raised from selected stock at home. Even in places where a honey flow is not in evidence, the recent good falls of rain have ensured of a fair amount of ground flora to keep the colonies contented during introduction. As well as assisting to build up strength in the hives for winter, the young queens will also tend to decrease the swarming tendency during next spring, which is a matter of importance in honey production early in the season.

Provision of Ample Stores.

For the provision of ample stores of honey, inland bee-farmers will be depending a good deal on a honey flow from the Red Stringybark (*Eucalyptus macrorrhyncha*). Honey from this species is generally very good for wintering. In the coastal districts, honey from tea trees (*Melaleuca* spp.) provides good winter stores, and Bloodwood (*E. corymbosa*) honey is satisfactory if produced during a reasonably dry time when the bees are able readily to process it and guard against deterioration.

Special wintering country exists on coastal areas toward the seaside, where heath plants and tea trees are well distributed, and advantage should be taken of what is offering

A Hive Well Provided with Winter Stores.

in this direction. There is a tendency to overstock the heath country which has already been tested, but some further pioneering work will no doubt show that a good deal of useful wintering country remains to be opened up along our extensive coastal seaside regions.

Feeding Sugar Syrup.

In some instances, where adverse conditions prevail during autumn, beefarmers will be forced to feed sugar syrup to supply the quantity of stores required to see the colonies of bees through the winter. In cases where supply of sugar for the purpose cannot be obtained locally, application may be made to the Department, giving particulars concerning the need to secure sugar, and stating the number of colonies to be fed and the quantity of sugar required. The name of the local storekeeper through whom supply is desired should also be stated.

Sugar is being made available by means of a co-operative arrangement between the Colonial Sugar Refining Company, the Producers' Distributing Society, and the Department of Agriculture. Following endorsement by the Department, the P.D.S. will arrange supply through the bee-farmers' local storekeeper.

Since the discontinuance of rationing, however, some storekeepers in bee-keeping districts have the benefit of a quota based on the special rations previously issued to local bee-keepers. They should, therefore, be prepared to meet bee-keepers' requirements. The availability of these local supplies should be fully investigated before application is made to the Department under the special arrangement referred to above.

Preparations for Wintering Bees.

Making the colonies of bees as comfortable as possible for the winter months is very important, whether the hives are established on special wintering country, or moved to contact a honey flow on inland country, or whether they are wintered under average seasonal conditions on home sites.

The main points to consider are:—

Hives with a good strength of bees should be reduced in size; generally the two-storey full depth or near equivalent where ideal supers are used, gives the best results.

Hives with a weaker population may be reduced to a single storey. This will leave

The Bees in this Nucleus Colony are Comfortable for the Winter.

the honey stores handy for the cluster of bees to feed on and care for during the cold weather.

Even when working a winter flow of honey in the warmer parts of the State, cold changes of the weather are experienced, which force bees to cluster closer together

and to store the honey as near as possible to the brood nest. Therefore, when an excessive number of supers is left on the hives, any honey stored well above the cluster is liable to deteriorate, and later cause dwindling troubles when the bees attempt to deal with it.

The writer has observed an occasional season—in the Tamworth district and on the central south coast—when conditions have been so mild right through the winter that the colonies have carried on brood-rearing fairly extensively during a winter honey flow, and reduction in the size of the hives was not essential. However, such seasons are exceptional.

Care must also be observed that a sunny, well-drained site is selected for the apiary, and in cold climates the hive entrance may be reduced in size.

Apiary Registrations Are Due.

Bee-keepers are reminded that apiary registrations are due on 31st March, 1948. An application form will be forwarded to all who are at present registered with the Department.

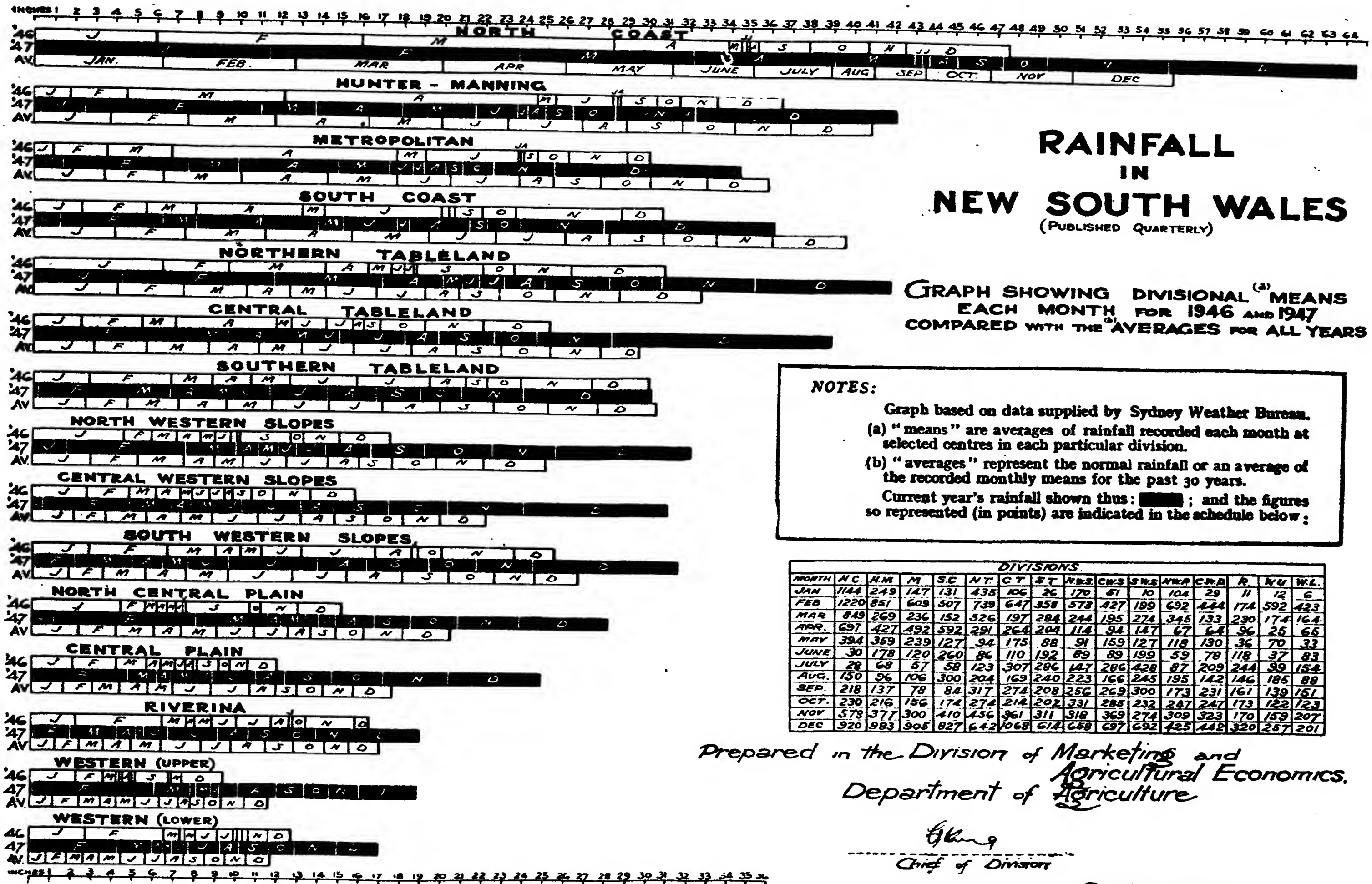
Special attention is directed to the need for completing the bee-keeping statistics form accompanying the application for registration. Bee-farmers co-operated very well in supplying statistical figures during the past year, and in the interests of the industry continued support in this direction is desirable. It is important to have sound statistics available. All completed forms are kept strictly confidential; they are detached from the registration forms immediately on being received at the Department and forwarded in bulk to the Government Statistician.

A Well-sheltered but Sunny Site.

Horse-Breeding Act Suspended Until February, 1949.

THE Horse-breeding Act, 1940, has been suspended for a period of twelve months, until 1st February, 1949. In making this announcement, the Minister for Agriculture, Mr. Graham, stated that it had been hoped to resume examination of stallions under this Act during the current year. Unfortunately, the necessary veterinary staff to carry out examinations was still not available, and it had again become necessary to suspend the Act for a further period.

Before the previous suspension of the Act in February, 1947, owners of stallions had been required by provisions of the Act to notify the Department of Agriculture in the event of transfer, castration or death of any stallion. Mr. Graham emphasised that all provisions of the Act were suspended, and that, until February, 1949, stallion owners would *not* be required to advise of transfer, etc., of stallions as mentioned above.



RAINFALL IN NEW SOUTH WALES

(PUBLISHED QUARTERLY)

GRAPH SHOWING DIVISIONAL (a) MEANS EACH MONTH FOR 1946 AND 1947 COMPARED WITH THE (b) AVERAGES FOR ALL YEARS

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "averages" represent the normal rainfall or an average of the recorded monthly means for the past 30 years.

Current year's rainfall shown thus: ▬ ; and the figures so represented (in points) are indicated in the schedule below:

	DIVISIONS.														
MONTH	N.C.	H.M.	M.	S.C.	N.T.	C.T.	S.T.	N.W.S.	C.W.S.	S.W.S.	N.W.P.	C.W.P.	R.	W.U.	W.L.
JAN	1144	249	147	131	435	106	26	170	61	10	104	29	11	12	6
FEB	1220	851	609	507	739	647	358	573	427	199	692	444	174	592	423
MAR	849	269	236	152	526	197	284	244	195	274	345	133	230	174	164
APR.	697	427	492	592	291	264	204	114	94	147	67	64	96	25	65
MAY	394	359	239	127	94	175	88	91	159	127	118	130	36	70	33
JUNE	30	178	120	260	86	110	192	89	89	199	59	78	118	37	83
JULY	28	68	57	58	123	307	286	147	286	428	87	209	244	99	154
AUG.	150	96	106	300	204	169	240	223	166	245	195	142	146	185	88
SEP.	218	137	78	84	317	274	208	256	269	300	173	231	161	139	151
OCT.	230	216	156	174	274	214	202	331	285	232	287	247	173	122	123
NOV	578	377	300	410	456	361	311	318	369	274	309	323	170	159	207
DEC	920	983	905	827	642	1068	614	658	697	692	425	442	320	257	201

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

[signature]
Chief of Division

Compiled and Drawn by E.K. Shannon
Checked by [signature]

PULLORUM DISEASE

A Major Cause of Mortality in Chickens, Ducklings and Turkey Poults.

(*Concluded from page* 105.)

D. G. CHRISTIE, B.V.Sc.,
Veterinary Officer.

THIS disease is probably responsible for heavier losses of young chickens than any other cause. The facility with which breeding methods spread the disease, demands first priority for measures to control it.

In the first portion of this article (in last issue), the author described the cause and predisposing causes of the disease, the cycle of infection, the losses that result, the appearance of the disease, the features of the outbreak and methods of diagnosis. This concluding section deals with method of treatment and control of the disease.

Treatment.

Outstanding success has been achieved in the treatment of affected chickens with the two sulfa drugs, sulfamerazine and sulfadiazine. In one experiment the two drugs were given on the first appearance of symptoms of the disease in batches of chickens which had been artificially inoculated with the germ. A mortality of 74.2 per cent. was observed in a control group which received no treatment, while in the sulfadiazine group the mortality was 4.4 per cent. and in the sulfamerazine group 2.9 per cent. Generally, mortality will be reduced by from 40 to 50 per cent. if the drug is used early in the outbreak.

The dose rate for sulfamerazine is ½ per cent. in the mash for eight to ten days if necessary, or 1 per cent. for four days. If the sulfamerazine is in tablet form it should be crushed to a fine powder, and mixed carefully with a little bran or pollard, which should then be incorporated with the rest of the ingredients. To make a ½ per cent. mixture approximately sixty tablets (each of 7½ grains) would be sufficient for every 12½ lb. of dry mash; double this quantity (120 tablets in 12½ lb. of mash) would make a 1 per cent. concentration. Sulfamerazine is expensive but its value in reducing mortality justifies its use.

It has been shown that survivors which had been treated when chickens with one of the above sulfa drugs, gave negative reactions to the agglutination test at nine months of age. This suggests that Pullorum-infected chickens treated with either of these drugs are not likely to become carriers.

In addition to the administration of sulfamerazine, management methods should be checked and any faults corrected. Any tendency to overcrowding should be adjusted, and, to overcome possible chilling and confer on the chickens an "artificial fever," the brooder temperature should be raised to 5 to 10 degrees above normal, providing chickens can freely move away from the source of heat. As previously mentioned, this increase in temperature has a beneficial effect in outbreaks of the disease.

Controlling the Disease.

If the cycle of infection (see diagram) is regarded as the defence cycle of the germ, one may consider any control measures as attempts to "dent" or "break" the cycle and so overcome the disease. The following measures should be observed in a campaign against the disease.

1. *Disinfection of Equipment.*—After an outbreak all brooding equipment should be submitted to a thorough disinfection. Effective disinfection entails first of all a scraping off of all droppings from equipment, followed by a thorough cleansing with 1 per cent. solution of caustic soda (1 lb. in 10 gallons of water) to remove dirt and grease. This prior cleansing is important, as no disinfectant is effective in the presence of dirt and grease. Then a careful scrubbing is carried out with some coal tar disinfectant such as cyllin used at the rate of 1 oz. to 2 pints of water.

Ideally, the brooder runs should be scraped clean and the surface soil replaced, but this is generally an uneconomic proposition and the best alternative is to spell the area, allowing sunlight to effect disinfection.

Never use brooder houses and runs for adult fowls during the year. This is not only a precaution against Pullorum disease, but also other conditions such as worm infestation.

2. *Isolate Survivors of an Outbreak.*—Ideally, survivors should be isolated and at about four months of age, tested to detect carriers.

3. *Detection of Adult Carriers.*—The agglutination test is employed to detect adult carrier birds, and these should be immediately removed from the farm. At the same time the sheds should be thoroughly cleansed of manure and litter and if practicable a disinfection carried out. Ideally, yards should be scraped and the top soil replaced, but this is generally out of the question.

A series of tests at intervals of about one month is necessary to detect carriers which were infected by droppings from carrier birds at or before the time of the removal of the latter. Once the level of reactors is reduced to below 1 per cent. an annual test may be all that is necessary, unless it is desired to establish a Pullorum-free flock.

While reactions to the agglutination test may vary with the intensity of laying (birds in full lay react more strongly than when off the lay) and some types of feed affect the tests, on the whole it gives very good results. In spite of its shortcomings most farmers recognise the valuable part which the test plays in the control of the disease in this State.

4. *Eggs for Setting Should be Collected from Tested Birds Only.*—Hatcherymen are particularly urged to set and maintain this standard.

5. *Fumigation of Incubators.*—The fumigation of incubators with formalin carried out from the eighteenth to the twentieth day will destroy the germs of *Salmonella pullorum,* and if the hatching chamber is thoroughly cleansed between hatches will prevent the spread by the incubator of infection from one hatch to the next (see pamphlet on fumigation).

6. *Management Aspect.* The provision of adequate warmth, insulation of the brooder house against sudden changes in temperature and the practice of raising the temperature of the brooder if an outbreak occurs, are all points deserving serious consideration.

Pullorum-free Flocks.

Pullorum-free flocks may be set up by means of the agglutination test. A series of tests would be entailed and when a completely negative result is obtained with the rapid test, a final test is carried out in the laboratory, using the tube test which is considered to be more accurate than the field test, although the latter compares very favourably with it.

Once the disease has been completely eradicated from the flock, every measure must be taken to prevent a "breakdown" with the reintroduction of infection. An official scheme is planned but staff problems have caused a deferment of the date of introduction.

It has been observed in America that birds from Pullorum-free flocks were relatively susceptible to the disease when exposed to infection. This raises the issue of breeding resistant strains *versus* eradication of the disease by means of the agglutination test. In our present state of knowledge the development of resistant strains

is not a satisfactory substitute for control by the agglutination test.

The Disease Summarised.

Pullorum disease affects young poultry, particularly during the first month of life.

The germ causing the disease can survive from season to season in moist situations and on brooder equipment.

The disease can be controlled by "breaking" the cycle of infection. The following measures are employed:—

(*a*) Disinfection of infected equipment and isolation of survivors of an outbreak.

(*b*) Detection of carrier adult birds by means of the agglutination test, with the disposal of these from the farm.

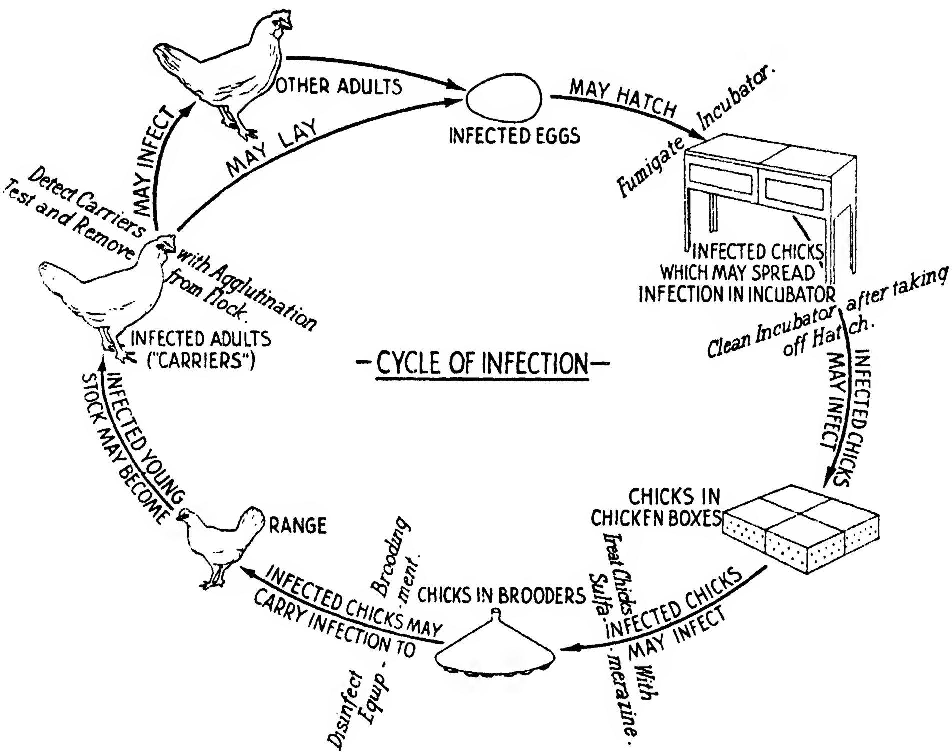


Diagram showing Cycle of Infection of Pullorum Disease and Control Measures Recommended.
[*Adapted from Biester and Devries.*

There is a definite cycle of infection: recovered chickens may become carriers and lay infected eggs; some infected eggs hatch and infection is spread to other chickens in the incubator.

Treatment with sulfamerazine commenced early in an outbreak is highly successful in reducing mortality.

(*c*) Cleansing and fumigation of the hatching compartment of the incubator between each batch.

(*d*) Attention to brooding equipment and management—provision of ample warmth and, in outbreaks, the elevation of brooder temperature above normal levels.

Pullorum-free flocks can be established.

THERE has been a considerable reduction in the area sown to rice this season, due to water-table trouble at the Yanco end of the Murrumbidgee Irrigation Area. This made it necessary to compulsorily reduce growers' areas in that section. The total area sown this season was 27,322 acres compared with 31,995 acres in 1947.

Poultry Notes.

March, 1948.

E. HADLINGTON, Principal Livestock Officer (Poultry).

THE BRITISH EGG CONTRACT.

THE recent agreement with the British Ministry of Food, under which 2s. 4d. per dozen will be paid for eggs in shell for at least three (3) years with corresponding increases in other egg products should enable the maintenance of an average price for eggs over those years which will have some relation to cost of production, provided that costs to the producer do not continue rising.

The recent rises in prices of poultry foodstuffs have increased the cost of feeding per hen by about 1/3d., making a total cost of at least 12s. 3d. per hen on a yearly basis. This would be much higher but for the increased quantities of mill offals now available. This is the highest cost since 1920-21 when the figures were 12s. 8d. and the average net price of eggs was 2s. 2d.

The contract with the British Ministry of Food calls for greatly increased production to reach the target laid down for export from next year onwards, and provided that adequate supplies of feed and materials are assured to the industry there is no reason why the goal should not be reached.

The position as far as the coming hatching season is concerned is sufficiently assured to justify every producer increasing the number of pullets raised to the extent of his rearing facilities and available labour.

To reach the objective of 3½ million cases for export in 1949 it will be necessary to bring back into use most of the numerous empty farms; existing flocks throughout Australia will need to be increased by at least 20 per cent. In addition, every effort must be made to increase the proportion of eggs of suitable quality for export.

Improving Quality.

A few of the main essentials in ensuring a greater proportion of exportable eggs are cleanliness, frequent collection, cool rooms for storage on the farm and marketings at least twice weekly. These, of course, involve

extra costs, and some incentive to carry out the work entailed would be the payment of a bonus on all eggs exported.

Cleanliness is most important; much could be done in this direction by keeping the birds enclosed in wet weather, provided that adequate dry scratching litter is kept in the houses.

On most poultry farms there are at least some semi-intensive houses, but in the majority of instances they are not utilised as originally intended. The birds are either not shut in the houses at all or are only enclosed after dark, then let out early in the mornings, wet or fine. Thus little benefit is gained from the system compared with roosting houses, either from the point of view of keeping eggs clean or increasing production during the winter months.

The correct procedure in the management of semi-intensive houses is to commence about 1st June and feed the birds in the scratching litter at approximately 3.45 p.m. and close them in. Subsequently they are only allowed out when the weather is fine and the yards are dry. This means that at times the birds may be closed in for several days and provision must be made for giving the mash feed in the houses as well as feeding the grain in the litter.

A good depth of litter is necessary to keep the birds busy, and in order to assist in keeping eggs clean the litter should be spread over the whole floor. The scratching area should preferably be divided from the roosting portion by a low wall to obviate the cleaning of the scratching area as frequently as the roosting section.

It is realised that this involves extra work, but it is essential that a greater proportion of clean eggs be marketed, particularly during the export season. The position must be faced squarely by every producer and every effort made to ensure the packing of a larger percentage of eggs for export during the flush season. This is essential to build up a better reputation on the British market, which is imperative if we are to hold that market when the present contract expires.

Double Semi-intensive Houses and Runs at Hawkesbury College.

With an increase in flocks to supply the requirements of the contract, it will be more important to maintain the highest quality in order to dispose of the surplus production during the flush season. Otherwise, if production of non-exportable eggs exceeds the demands of the local market a slump in prices can be expected.

Country Production.

If country production increases extensively as a result of higher prices, the industry will be confronted with the problem of providing an outlet for eggs produced in far distant country districts and which cannot be exported. These eggs, while of good quality when produced, will not stand up to the present methods of handling and will not reach the export floors in a suitable condition for export.

Therefore, either greatly improved transport conditions must be provided or the local market will be seriously embarrassed by a large surplus of eggs below first quality which cannot be sold in shell or converted into pulp for export.

Management of Laying Stock in Canada and U.S.A.

EXTRACTS from the report by a British Poultry Mission which recently visited Canada and United States of America will be of interest to poultry farmers here. Portions of the report dealing with management of layers and costs are quoted below. When reading it is important to remember that when the words "this country" or similar words occur, they refer to Great Britain:—

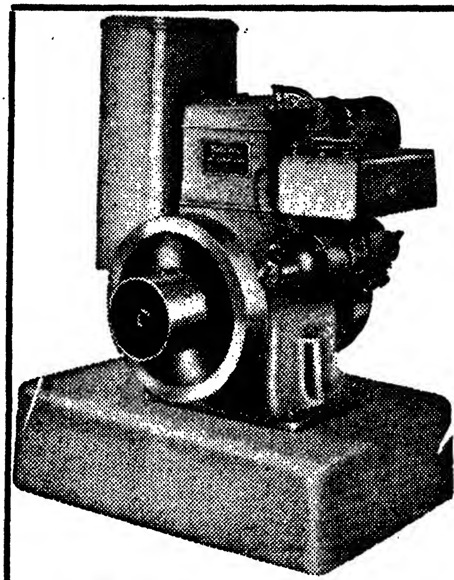
"In both Canada and United States of America—particularly the latter—labour charges are relatively high. An ordinary poultryman normally obtains £600 per annum, but the price of eggs ranges between 1s. 8d. to 3s. 0d. per dozen. In this country the wages rate would be about £250. It is, therefore, regarded by the North American poultry keeper as essential to keep his labour costs as low as possible by intensive housing, and by a high degree of mechanisation on the larger poultry farms. In the majority of instances family labour only is employed in an attempt to keep labour charges at a minimum. The need for intensive housing is further emphasised by the popular requirements that eggs shall be clean and yolks light in colour; both requirements are achieved in part by keeping birds off the range. Further, whereas the retail price of a table bird in this country now approximates to 15s., in the United States the price is about 10s., or less. It will be realised that this charge is low in comparison with wage rates in that country. Wage rates are high and the selling price of a bird relatively low, whereas by comparison the reverse is true in Great Britain.

"Reference has already been made to climatic conditions, long-lying winter snows and baking summer sun, which necessitate the birds being kept in houses during a large part of the year. The result of these conditions is that the majority of birds in North America are kept in houses during their entire laying life, and this intensive method of management also enables considerable numbers to be looked after by one man.

"In most cases rearing is carried out on range, but the general practice is to shut birds into the intensive houses as soon as they reach maturity. It was, however, interesting to note that free range for laying and breeding stock increases as the more backward areas are reached—and incidentally the average egg production decreases. It is the common practice for the birds to remain in the intensive houses from maturity until they finish their laying year. This intensive system allows large houses to be used, and this in turn allows the extensive use of mechanical methods of feeding, egg collecting, watering, etc. In many of the houses, overhead rails, with slung cradles down the centre are utilised, and one man may, by these mechanised devices, look after a house carrying as many as 5,000 or 6,000 or more birds. The house often has no partitions (or perhaps for breeding flocks partitions with doors) and the cradle can pass through the entire length of the house, which may extend for several hundred feet.

"Another labour-saving device which has become popular during the war is the use of deep litter. Instead of the customary removal of dirty litter and the spreading of fresh clean material every week or so, the litter is built up throughout the year. The Mission could not detect that the birds suffered at all through this system of management. In some cases the droppings fall on the litter and remain in it. In other houses dropping pits are situated under the perches and are cleansed every few months.

Ventilation is, therefore, an important problem, and the Mission was impressed with the efforts expended to ensure that it is of a high standard. The use of deep litter received a big fillip during the war when labour was extremely difficult. The Mission considered that this method of management might lead to troubles off-setting the labour-saving advantages, though it will be remembered that the humidity of the atmosphere is generally appreciably lower than in this country. Naturally, where



disease breaks out amongst the birds the losses are high, but in any case the mortality generally for Canada and the United States of America is substantially higher than in this country. The rate of culling is also high, and it is therefore more convenient to use a depletion figure. The depletion figure in adult stock seems to be generally between 30 and 50 per cent. Epidemic diseases, particularly of a respiratory nature, are common under this type of management.

"Feeding is not, of course, as difficult as in this country at the present time, although most poultry keepers seemed dissatisfied with the animal protein content of the commercially prepared mashes. Soya bean meal forms the main source of protein, and most of the patent mashes have contents of 20 per cent. 'Cafeteria' feeding is common and mixed grain foods are, of course, plentiful. The method of cafeteria feeding is to utilise a trough divided off into sections of varying sizes and for these to be filled with mash, mixed grain, grit and in a few instances other materials, *e.g.*, pellets. The troughs are filled every one or two days, and the birds are thus able to help themselves to as much as they require."

Poultry Foodstuffs and Egg Prices.

"The only cause of dissatisfaction over feeding stuffs amongst poultry keepers seems to be the shortage of animal protein. Most mashes seen by the Mission contained 20 per cent. protein, but this is supplied mainly in the form of soya bean meal. Those districts near slaughter areas, *e.g.*, around Chicago, obtain a proportion of meat scrap, but generally speaking protein is supplied in vegetable form. The poultry industry consumes between 25 and 30 million tons of concentrates per year, and these include 15 million tons of mixed commercial feed. It is estimated that about 60 per cent. of all commercially made feed is fed to poultry. The cost of feed approximates to $3.75 (18s. 9d. stg.) per cwt. (approximately 23s. 5d. Aust.) whilst the average price of eggs to producers is 37 cents. (1s. 10d. stg.) per dozen (2s. 3½d. Aust.).

"The price of hatching eggs does not offer a much higher return when compared with table eggs. It is the customary practice for the hatchery to offer for hatching eggs 5 cents per dozen above the market price for first quality table eggs. This charge is based on a hatchability of 50 per cent. It is usual to reimburse the breeder with 1 cent for every increase of 1 per cent. in hatchability above the basic figure of 50. The price of day-old pure bred pullets is round $14 (£3 10s. 0d. stg.) per 100 (£4 7s. 6d. Aust.). It will be realised that there is every incentive for American poultry keepers to go in either for very large units in which the labour is cut to a minimum and overheads greatly reduced, or to have a small unit not requiring the full-time services of a man."

First-Year Hawkesbury College Diploma Course.

At Wagga Experiment Farm.

THE first-year Hawkesbury Agricultural College Diploma in Agriculture Course at Wagga Experiment Farm was opened officially by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) at Wagga Experiment Farm on Thursday, 19th February.

The Minister said that owing to the strain on students' accommodation at Hawkesbury College, it had been decided to make Wagga Experiment Farm available to take approximately forty students entering for the first-year of the Hawkesbury Diploma in Agriculture Course.

In the past few months, returned servicemen trainees had been studying at Wagga whilst undergoing two-month refresher courses in agriculture. Both course and trainees had now been transferred to Yanco Experiment Farm.

Wagga Farm was especially suited to take first-year students of the Hawkesbury Diploma in Agriculture Course, as it was the centre of one of the best wheat-growing and sheep-breeding districts in the State, said Mr. Graham. Excellent buildings and lecture rooms were available for accommodation of students at that farm.

Present arrangements were that students who successfully passed their examinations at the end of first-year would proceed to Hawkesbury Agricultural College for completion of their studies.

Tidying-up the F.A.Q.—*continued from page* 118.

cases relating to the valuation of Australian wheat, most of the factors, including the principal one of the percentage of millable grain, can be measured.

Evidence of the unsatisfactory character of methods which depend on personal opinion and of the satisfaction which results when these are altered to provide for decisions which are determined by measurement, is furnished by the experience of the Department of Agriculture in connection with the issue of official certificates for export wheat, guaranteeing that wheat cargoes to which they referred conformed to the standard under which they were sold. Prior to 1922-23 the method of evaluation was according to the judgment of an experienced inspector. Under this method disputes as to the soundness of the judgment of the inspector were incessant. The position was intolerable and compelled a search for a better method. This was eventually found by defining in simple language the characteristics of the standard being used. This included the main feature—the percentage of millable grain—and other physical ones capable of being measured.

The position improved almost immediately. The attitude towards the inspectors changed, arguments and disputes ceased, because in a case of doubt reference was made to the result of the measurable factors about which there could be no argument. It is safe to say that no one in the West Australian Wheat Trade would wish to abandon the existing method of definition and measurement and revert to the old one of decision by personal opinion.

(*To be concluded.*)

Return of Yanco Experiment Farm—*continued from page* 121.

tion was now needed to accommodate first-year students of ex-servicemen who desired to take the three years H.D.A. Course.

It had long been the intention, said Mr. Graham, to make Yanco the training centre for ex-servicemen, and that objective had now been achieved. The Farm was ideally suited to this purpose.

Mr. J. B. McBean, Co-ordinator of Rural Training, representing the Director of War Service Land Settlement, and Mr. K. Todd, Country Vice-President of the R.S.S.A.I.L.A., were also present and addressed the students.

Prevention of Sprouting in Potatoes—*continued from page* 129.

period was 19 per cent. The temperature of the stack at the time of the inspection was 65 deg. Fahr.

Summary.

Although the treatments did not completely prevent sprouting (this may have been due to uneven dusting), development of sprouts was considerably retarded and the quality of the tubers had not deteriorated to any extent.

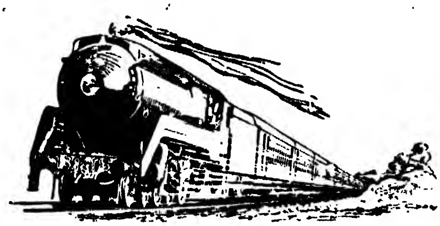
Provided this hormone can be obtained and applied at a reasonable cost it should enable table potatoes to be stored in a satisfactory condition for a longer period than is possible at present.

The results at Crookwell were similar to those obtained at Batlow.

Acknowledgments.

The test at Batlow was carried out in co-operation with the Manager, Batlow Packing House Co-op. Ltd., who was good enough to make the necessary material and facilities available for this purpose.

I desire to acknowledge the generous assistance given by Mr. G. R. Vincent, Chief Field Officer of the Batlow Packing House, and Mr. J. E. Dodds, Batlow, in carrying out the Batlow trial. The co-operation of Mr. A. R. Willis, Cloverleigh, Crookwell, Mr. T. L. Caddy and Mr. J. Hill, Guyra, for their assistance in connection with the investigational work is also gratefully acknowledged. Messrs. W. D. Hardy and J. B. Noonan, District Agronomists, supervised the Crookwell and Guyra trials respectively.



NEW TRAINS
FOR NEW SOUTH WALES

★

Be sure to see the new railway car on exhibition in Manufacturers' Hall at the Royal Agricultural Show.

Twenty-eight of these modern vehicles will soon be placed in service between Sydney and Newcastle. They will be formed into four Newcastle Expresses of seven cars each.

These cars will be air-conditioned, and will be of all-steel construction except for interior decoration and panelling for which polished timbers, rubber compositions, and stainless steel fittings will be used. Comfortable seats specially sprung and upholstered, fluorescent lighting and individual reading lamps, and insulated floors, sides and roofs to reduce track noises, are features included. In addition, buffets for serving light refreshments by a uniformed staff, and attachments for occasional, hinge-drop tables, will be provided. Externally, the carriages will have a streamlined appearance and will be painted tuscan red and russet relieved with chrome yellow bands.

In addition to the twenty-eight cars being built for the Newcastle Expresses the Department is awaiting the delivery of fifty cars for steam day trains running between Sydney and country areas. These carriages will be the steel corridor type and will also be air-conditioned. The trains formed by these new cars will have a special air-conditioned buffet car seating 27 diners.

S. R. NICHOLAS,
Secretary for Railways.

Sheep Nutrition in Eastern New England.

VALUE OF PASTURE IMPROVEMENT.

Demonstrated at Shannon Vale.

PASTURE improvement is the only effective economic means by which graziers on the poorer granite soils of the eastern New England slopes may breed and rear weaners successfully, prevent mortality from winter malnutrition and effect a substantial increase in their wool clips.

Although spring and summer pastures in that area are usually adequate to ensure body-maintenance and growth, breeding is a virtual impossibility by reason of the wide-spread poverty of the winter pasturage. The usual practice is to purchase from the west young hogget wethers which have limited productive life on such poor pastures.

"In an effort to find suitable methods of improving nutrition in sheep run on these slopes, the Shannon Vale Nutrition Station, established by my Department, has been engaged for some eleven years in long-term trials in sheep management, pasture improvement, etc.", stated Hon. E. H. Graham, M.L.A., Minister for Agriculture, recently.

"Those investigations have been characterised from year to year by markedly consistent improvement in both animal health and wool production of sheep run on improved pasture, as against sheep on unimproved pasture."

It was felt, said Mr. Graham, that the following case for improved pastures—built up from the findings of the Shannon Vale investigations—could be presented with confidence to graziers whose properties had conditions similar to those in the Shannon Vale area.

Unimproved pastures could be expected to return only 5.6 lb. wool per acre from dry sheep. Such conditions also prohibited breeding or successful rearing of weaners, and there might be frequent serious mortality.

A small expenditure of up to 13s. 6d. per acre spent entirely on pasture improvement could be expected to return 9 lb. wool per acre from dry sheep. It could also be expected to prevent mortality from malnutrition and to permit breeding and rearing of weaners.

The difference between the value of the first-mentioned cut of 5.6 lb. per acre and that of the cut of 9 lb. (at, say, 40d. per lb.), in the first clip alone would almost completely cover the expense incurred in pasture improvement. Thereafter, the only outlay necessary to maintain the pastures being the small annual cost of applying superphosphate, this increased clip would stand as almost clear profit to the grazier; hence pasture improvement on such soils must clearly be regarded as a profitable undertaking.

This work at Shannon Vale had been assisted by an annual grant from the McGarvie Smith Institute, said the Minister, who expressed his appreciation of the practical interest so shown.

The Minister also pointed out that many graziers did not realise that Section 75 of the Income Tax Act permitted amounts of money spent in sowing grasses and in application of fertiliser to be items deductible from income for income tax purposes.

Viticultural Notes—*continued from page* 131.

Advantage of Sulphuring with Light, Dry Wines.

In the making of light, dry, white wines, such as hock and chablis, immediate sulphuring of the juice after separation from the skins, and allowing it to stand for twenty-four hours for the settlement of pulpy matter and other deposits before fermentation commences, results in a much better quality product.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Hawkesbury Agricultural College, Richmond (Jerseys)...	106
Hicks Bros., "Meryla," Culcairn (A.I.S.)	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
McEachern, H., "Nundi," Tarcutta (Red Poll)... ...	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys) ...	49
New England University College, Armidale (Jerseys) ...	25
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	35
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco (Jerseys)	76
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	37
Salwey, A. E., Cobargo (Stud Jerseys)	62
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S.)	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas, R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R., "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	42
Forster, T. L., and Sons, "Abington," Armidale ...	62
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys) ...	89	25/8/48
Berry Training Farm, Berry (A.I.S.) ...	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys) ...	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys) ...	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys) ...	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys) ...	33	23/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys) ...	113	14/8/49
Cowra Experiment Farm (Ayrshires) ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys) ...	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	3/3/48
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.) ...	49	17/12/48
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys) ...	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns) ...	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys) ...	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires) ...	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus) ...	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns) ...	74	2/2/49
Limond Bros., Morisset (Ayrshires) ...	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys) ...	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys) ...	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys) ...	51	11/4/48
New England University College, Armidale (Jerseys) ...	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys) ...	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns) ...	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys) ...	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus) ...	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus) ...	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys) ...	94	27/10/48
Riverina Welfare Farm, Yanco (Jerseys) ...	91	14/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns) ...	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys) ...	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus) ...	170	21/2/48
Wagga Experiment Farm (Jerseys) ...	58	3/3/48
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords) ...	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus) ...	160	2/6/49
Wollongbar Experiment Farm (Guernseys)...	119	20/4/48
Yanco Agricultural High School, Yanco (Jerseys) ...	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns) ...	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake ...	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle ...	49	14/4/48
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown ...	18	14/4/48
Brookfield Afforestation Camp, Mannus ...	209	12/8/48
Burns, R. "Wilga Glen," Coonamble ...	20	24/12/48
Cameron, N., Montrose, Armidale (late New England Girls School) ...	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell ...	32	11/8/48
Coventry Home, Armidale ...	11	29/9/48
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home ...	29	25/2/49
Ehsman Bros., Inverell ...	39	29/8/48
Emu Plains Prison Farm ...	122	21/3/48
Fairbridge Farm School, Molong ...	25	9/7/47
Forster, T.L., and Sons, "Abington," Armidale	62	24/5/48
Frizelle, W. J., Rosenstein Dairy, Inverell ...	111	9/9/48
Genge G. L., Euston, Armidale ...	36	22/9/48
Goulburn District Hospital ...	4	7/11/47
Goulburn Reformatory, Goulburn ...	8	11/6/48
Grant, W. S., "Monkittee," Braidwood ...	22	20/5/48
Hannaford, A., Braidwood ...	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell ...	60	30/6/47
Hopkins, E. G., Wattle Farm Guest House, Bargo ...	4	27/6/48
Hunt, F. W., Spencers Gully ...	80	4/2/49
Ince, F., Hillgrove Road, Armidale ...	34	22/9/48
Johnson, A., "Rosedale," Grafton Road Armidale ...	34	22/9/48
Kenmore Mental Hospital ...	52	26/6/47
Koyong School, Moss Vale ...	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lucas, L., "Braeside," Armidale ...	45	22/9/48
Lunacy Department, Callan Park Mental Hospital ...	43	4/4/47
Lunacy Department, Gladesville Mental Hospital ...	7	12/12/48
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital ...	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital ...	40	20/11/48
McMillan, N., Duval Road, Armidale ...	30	29/9/48
MacNamara, B., "Mount View," Cessnock...	58	16/5/48
Marist Bros. College, Campbelltown ...	70	3/1/48
Mason, A., Killarney, Armidale ...	33	30/9/48
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell ...	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
O'Brien, O., "Mount View," Inverell ...	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
St. Ignatius' College, Riverview ...	27	14/8/48
St. John's Hostel, Armidale ...	6	24/6/49
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie ...	12	29/12/48
St. Michael's Orphanage, Baulkham Hills ...	43	5/6/48
St. Patrick's Orphanage, Armidale ...	12	29/5/48
St. Vincent's Boy's Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay ...	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	53	10/2/48
Tanner, F. S., Duval Rd., Armidale...	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale ...	33	30/9/48
Tombs, P. C., Kellys Plains, Armidale ...	49	29/9/48
Tombs, R., Harlwood, Armidale ...	40	22/9/48
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook ...	97	24/4/49
Ursuline Convent, Armidale ...	5	7/10/48

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number Tested.	Expiry Date.	Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*			Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Wallaga Lake Aboriginal Station	19	29/4/47	Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
Waters, A., Marsh Street, Armidale... ...	2	13/10/48	William Thompson Masonic School, Baulkham Hills	52	10/6/48
Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48	Youth Welfare Association of Australia ...	171	14/4/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47			

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein uuless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Quality of the 1947-48 Wheat Harvest.

Five Classes of Grain Segregated at Receiving Stations.

THE Department of Agriculture has received many inquiries as to the value for milling into flour of the various classes of the current season's wheat.

The following five classes of grain have been segregated at country receiving stations:—

1. F.A.Q. grain. Sound wheat over 59 lb. per bushel in weight.
2. Sound grain from 54 to 59 lb. per bushel in weight.
3. Sound grain under 54 lb. per bushel in weight.
4. Damaged grain (shot and sprung) over 54 lb. per bushel in weight.
5. Damaged grain under 54 lb. per bushel in weight.

There will not be any major difficulties concerning the milling quality of F.A.Q. wheat.

Sound grain from 54 to 59 lb. per bushel in weight will also be a milling grade, although the flour yield obtainable from the wheat will be reduced by comparison with F.A.Q. wheat, and the output of mills will also be reduced if they are forced to grist large quantities of this grade.

Many of the inquiries received concern the value of shot and sprung grain over 54 lb. per bushel in weight. The main disadvantage of this grain is that with partial germination, diastatic enzymes are not only released, but are synthesized within the grain. As a consequence, the resultant flour has excessively high diastatic activity. As a rule, Australian wheat is markedly low in diastatic activity, and usually requires supplementation with malt flour; but if diastatic activity is excessive, bread made from the flour does not bake out properly and is unpalatable.

The quality of sprung and shot grain is directly related to the quality of the grain before weather damage. It is obvious, therefore, that some damaged grain will be superior in quality of some sound grain.

The amount of damaged grain that can be added to a grist is limited. Most of the inquiries received concern this question. The amount that can be added will depend on the initial quality of the grain, prior to weather damage, considered in relation to the quality of the wheat comprising the remainder of the grist. It is difficult, therefore, to fix a definite amount.

The two grades under 54 lb. per bushel in weight, in all probability will not be suitable for milling into flour.—CHEMIST'S BRANCH.

The Agricultural Gazette
OF NEW SOUTH WALES.

APRIL, 1948.

THE DEPARTMENT At the Royal Show.

THIS year the Department of Agriculture's exhibit at the Sydney Royal Show was housed in a newly-constructed court. Using modern and attractive display technique, each of the bays within the court aimed to convey a simple, straightforward statement of what the Department had achieved or was aiming to achieve for the benefit of the public—rural and urban.

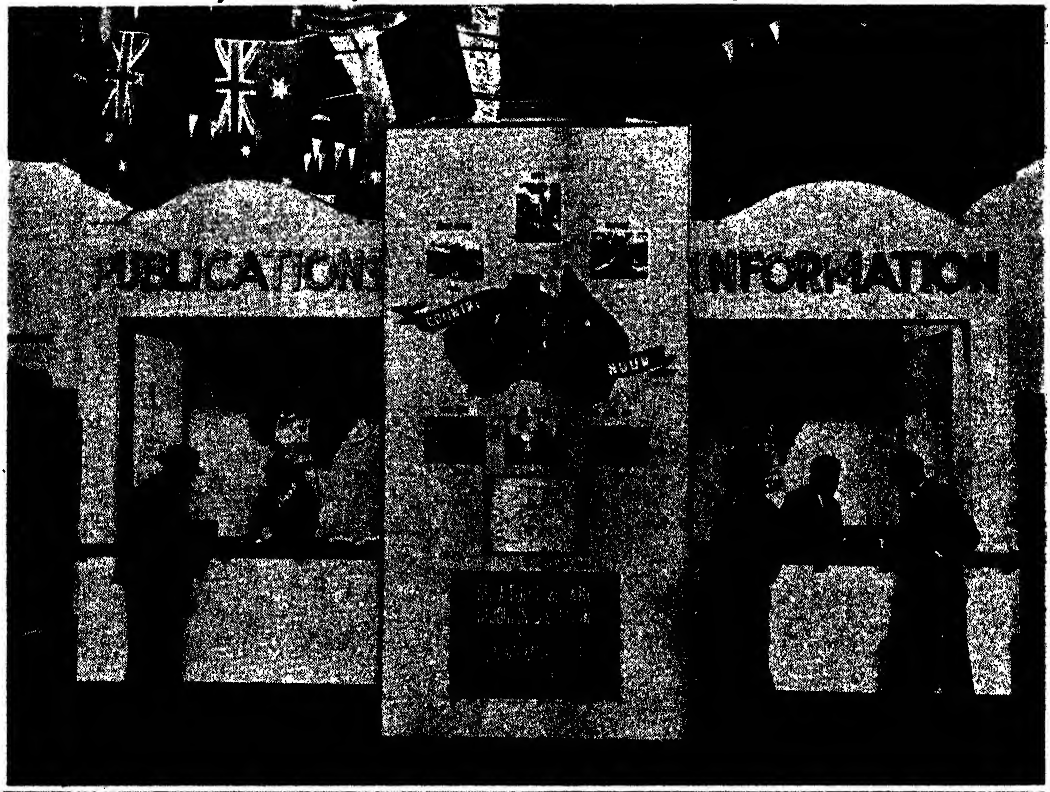
Sections of the exhibit were devoted to crop production, pastures and weeds, farm machinery, pests and diseases, agricultural chemistry, botany, dairying, animal husbandry, stock diseases, agricultural education, fruit production, agricultural economics and marketing, information and extension services. Facilities were also provided in the court for screening agricultural films and for broadcasting rural topics.

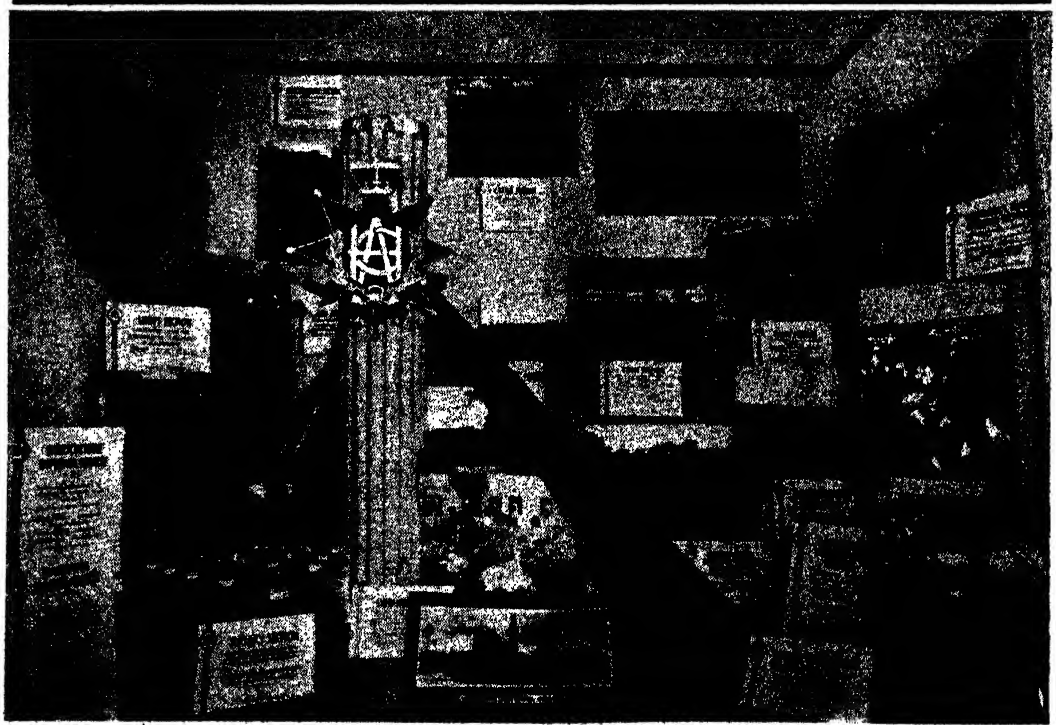
Whilst the primary object of the display was to put producers in touch with the Department's services, an attempt was made to interpret the Department's achievements and aims in terms of interest to city folk, who far outnumber farmers at the Royal Show.

What the Department has done, and is doing, to breed better crops and stock, for instance, may seem of scant interest to the city dweller. Far from it. Improved wheats, better quality fruit and high-grade animals mean increased supplies of more nourishing foodstuffs—butter, bread, milk, beef, mutton, lamb, pigmeats, fruit, vegetables, etc. In that way the Department of Agriculture is making a valuable contribution to achieving a higher standard of living for the general public, at the same time making the going easier and more profitable for producers.

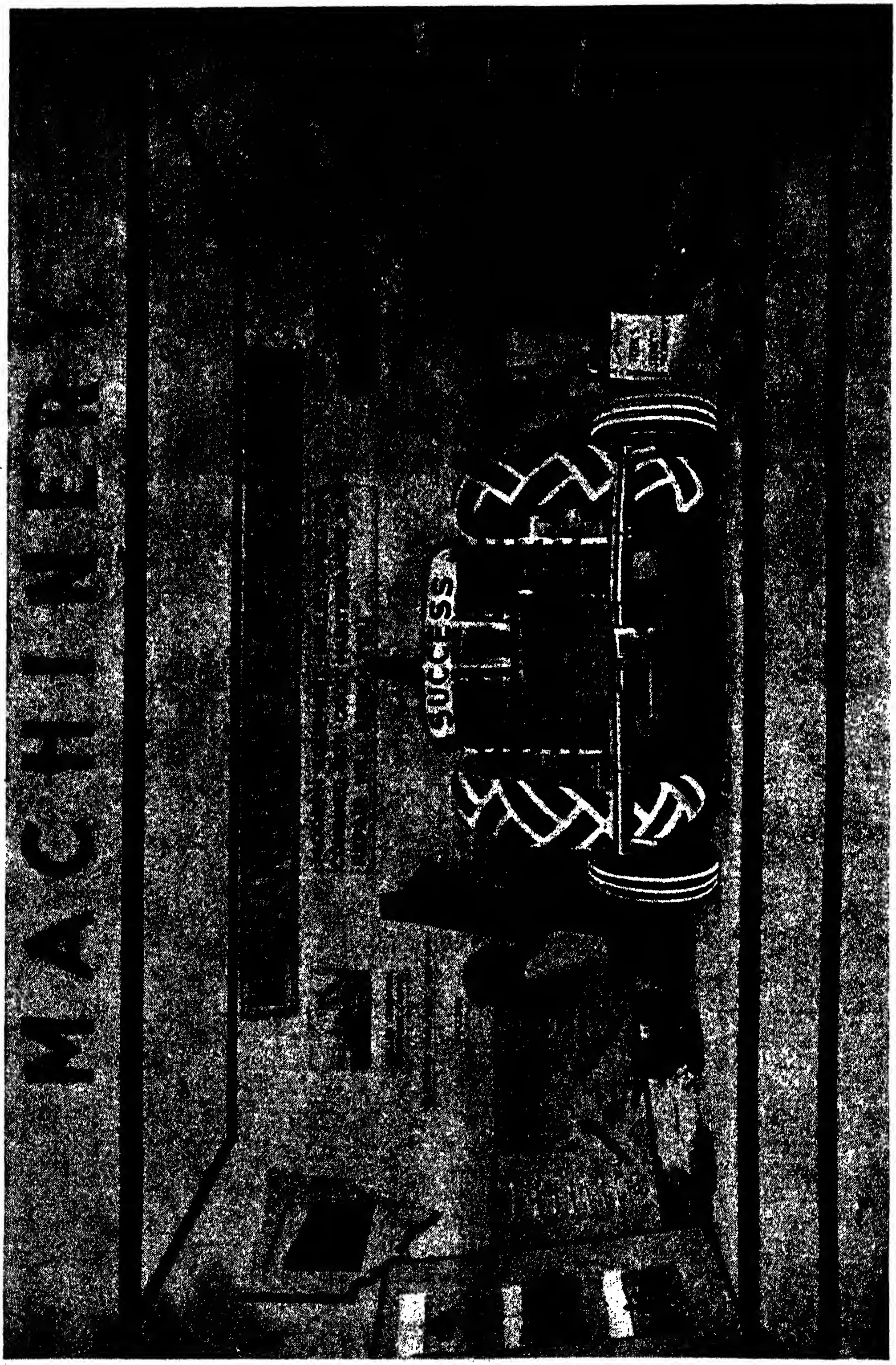
In the final analysis a progressive programme of agricultural research and experiment adds up to ensuring, improving and protecting the Nation's food supply. That central theme ran through the Department's display at this year's Royal Show.

Bays in Department's Court at Royal Show.



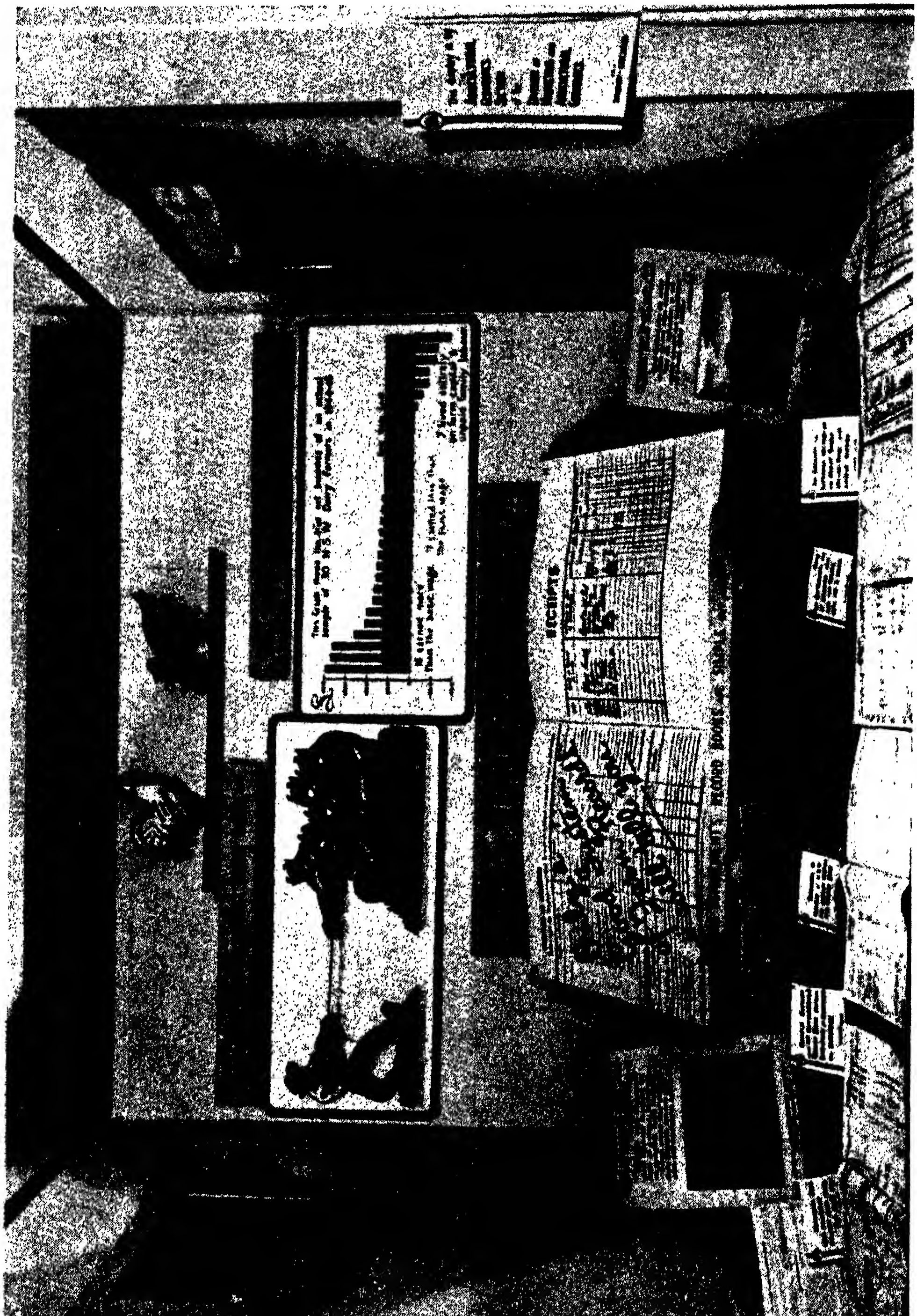


Colourful and Instructive Display by Division of Horticulture—Royal Show, 1948.



Machinery Section's Display In Department's Court at Royal Show.

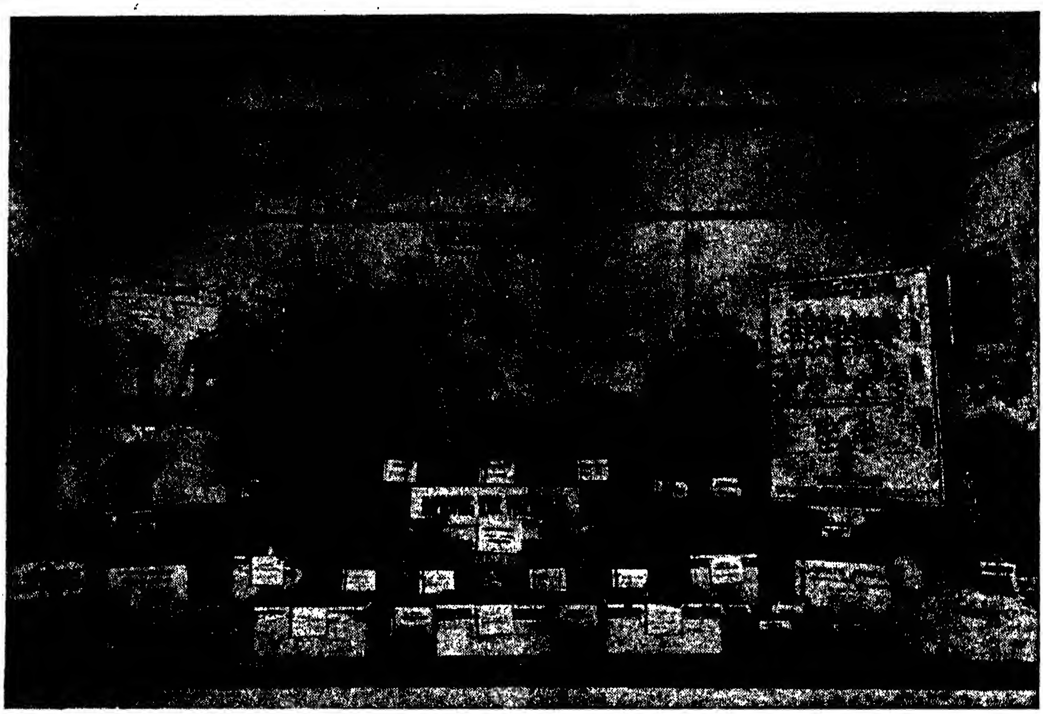
Division of Dairying's Bay in the Department's Court.

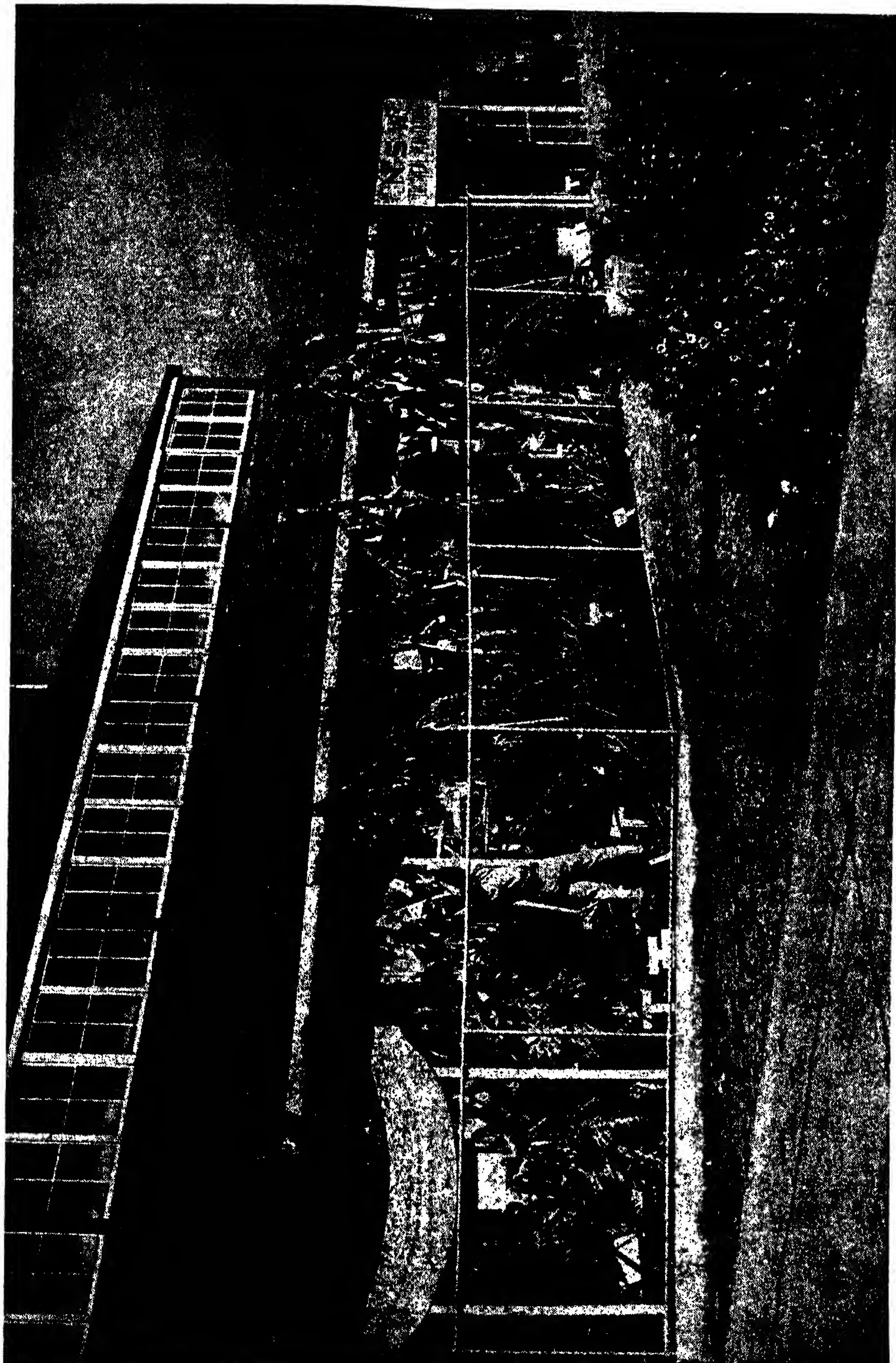


Display by Economics Section of Division of Marketing and Agricultural Economics.

Instructive Displays by Branches of Division of Science Services.

Displays by Divisions of Animal Industry and of Plant Industry.





Tropical Plantation at Royal Show. Staged by Department and Banana Growers' Federation.

HAY STRADDLES

Keep Rats and Mice From Stacks.

Methods of Erection and Materials Required.

J. A. WILLIAMSON, H.D.A., Farm Manager, Hawkesbury Agricultural College.

A WELL-CONSTRUCTED hay straddle is one of the cheapest and most efficient means of preventing rats or mice from entering haystacks. Any handyman can construct an efficient hay straddle from material about the farm, with the following particulars and the accompanying drawings to guide him.

The actual dimensions of the straddle will vary according to the tonnage it will be required to support. A straddle 20 feet wide and 35 feet long will hold approximately 45 tons of hay, while a straddle 20 feet wide and 55 feet long will hold at least 75 tons—and depending on the height of the stack up to 90 tons. Smaller stacks can be made on straddles that are narrower in width if required, but it is inadvisable to make straddles less than 15 feet wide.

A straddle 20 feet wide is preferable for most stacks, the length being increased according to the tonnage. With a straddle of this width, every 5 feet 9 inches of length will represent approximately 7½ tons of hay; thus a straddle 20 feet wide and 35 feet long would hold 45 tons.

As a stack on a straddle has its base 3 feet above ground-level, it is generally found that stacks built to a height of 15 feet to eaves, and to a similar height from eaves to ridge, are the most economical. Stacks of greater height usually need additional labour to complete.

A straddle 20 feet wide and 35 feet long is a useful size for most farms—that is, a straddle that can hold approximately 45 to 50 tons of hay. A chaffcutting contractor can usually cut a stack of this size in two days, and it will provide full rations for a year for fifteen working horses, or drought rations for five hundred sheep for four and a half months.

Materials Required.

Bush timber can be used throughout for construction of the straddle. The posts may be either round timber or split posts; they should be cut to a 5-foot length—and if

A Stack of Hay on a Straddle.

round, be of 10-inch minimum diameter. All posts, particularly round posts, should be burned for at least 3 feet 6 inches of their length to charr away all sap wood. A flame-thrower will enable this to be done quickly. Afterwards, the posts should be painted with sump oil as a further protection against white ants.

With straddles 20 feet wide the posts are arranged four in a line, each post 5 feet 9 inches apart on the square. The treated ends of the posts are placed 2 feet 3 inches down in soil of average texture and 2 feet 6 inches down in lighter soils. After erection, the posts are cut to true level with an average height above ground-level of 2 feet 3 inches.

All posts are capped with a square of galvanised iron at least 18 inches square, and preferably 2 feet square. If iron is not available, old plough discs face-down can be used instead.

Rails 6 inches in diameter at the small end and 20 feet long are then placed across each line of four posts to join them together and to support the decking. These rails project over the posts at each end by approximately 1 foot 3 inches. Each line of four posts is secured in this manner, the rails being fastened to each post by decking spikes.

Rails 6 inches at the small end are then placed over the cross rails along each side for the full length of the straddle, extending approximately 1 foot at each end. These rails are securely tied with No. 8 wire.

The decking is then laid lengthwise along the straddle. If no old fence posts are available, saplings 12 feet long and 3½ inches at the small end will be found quite satisfactory.

The saplings or poles are laid with spaces between them so that ends of adjoining decking fit between them. This ensures that all decking has a full bearing on the rails at both ends—thus making it stronger than decking that is butted end-to-end.

If 12-foot poles are used, these will cover the first two sections of the straddle, and for a 20-foot wide straddle thirty poles will be required—as well as the edge rails of heavier timber already mentioned. The next two sections will take twenty-eight poles, the next two thirty poles, and so on alternately.

The whole decking is then covered with wire netting which is secured at the sides of the straddle by doubling over, by weaving No. 8 fencing wire through the doubled netting, and then by nailing into position. This netting acts as a safety device to prevent the worker, when stacking, from falling through the spaces between the decking, and also to prevent the sheaves and loose straw from protruding through and hanging down, so enabling mice or rats to gain access to the stack.

After the netting has been laid, a further rail is sometimes used at each end to join the side rails, to act as a support to them and to hold the ends of the decking securely in position. In practice, though, this has not been found essential.

The materials required for a straddle 20 feet wide by 35 feet long are as follow:—

Twenty-eight posts, preferably iron bark or box, 5 feet long with a 10-inch diameter.

Nine rails, preferably iron bark or box, 20 feet long and 6 inches at small end.

Four rails, preferably iron bark or box, 18 feet long and 6 inches at small end.

Eighty-eight saplings or poles, preferably iron bark or box, 16 feet long and 3½ inches at small end.

Twenty-eight iron decking spikes to spike rails to posts.

Three and a half sheets of galvanised iron of 20 g. to provide 28 caps to posts.

Fifty yards of approximately No. 8 wire to tie side rails and thread through netting.

Eighty-four yards of 3-foot wire netting; old netting is quite satisfactory.

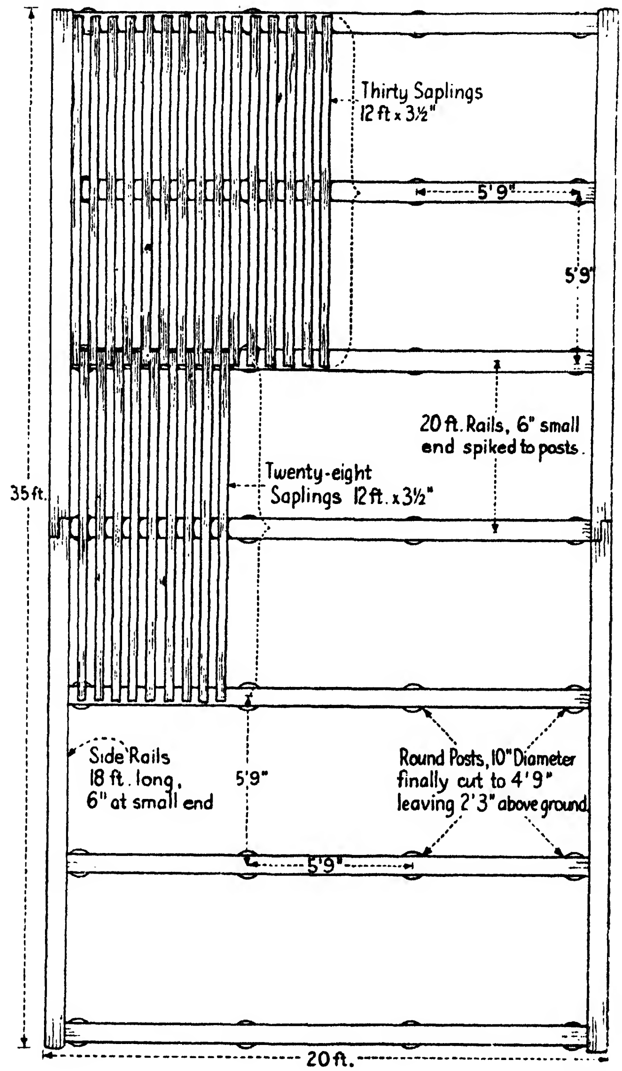
Method of Erection.

Mark out the site of the straddle to ensure right angled corners and put in peg to mark the position of each outside post.

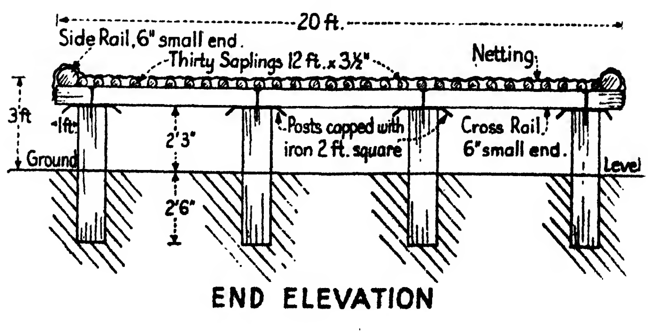
Sink holes and erect the outside posts. Cut off one corner post to the required height. Then, using the straight edge and level, mark all other outside posts to the true height at which they are to be cut off. The centre posts can then be placed in position and marked for cutting by using a string line from the corner posts.

Having erected all posts, saw off to correct height.

PLAN AND ELEVATION OF HAY STRADDLE.



PLAN



END ELEVATION

Cap the posts with galvanised iron squares, using a clout to hold the caps in position.

The rails should be notched before being placed in position on the posts so that maximum hold on the posts is secured. The rails laid across each line of four posts are held in position by iron decking spikes.

After notching, the outer rails are placed in position, then tied securely with No. 8 wire.

The decking is then laid in position with spaces between, as described previously, and finally the netting is stretched over the straddle and securely fastened in position with No. 8 wire.

All ends of rails which project irregularly are sawn off neatly, and sump oil or tar is applied to all saw cuts to prevent the timber from rotting.

Precautions Against Mice and Rats.

Rats and mice can gain access to stacks by the flimsiest of bridges; hence, particular care should be taken to see that the efficiency of the straddle is not impaired. Weeds must not be allowed to grow up against the sides, nor must loose straw be left hanging down from the straddle. Ladders, pitchforks, rakes and sticks must not at any time be left leaning against a straddle. Any such neglect will give rats or mice entry to a stack and so nullify the sound protection afforded by the straddle.

"Sprung" and "Shot" Seed Wheat.

Effect of Storage and Treatment on Germination.

IN the February issue of the *Agricultural Gazette,* were published germination results of "sprung" and "shot" seed from the three wheat growing areas of the State. The seed had been dusted with Ceresan and copper carbonate before testing, with a third lot left untreated as a control. At the time when these tests were made, seed from the same samples, treated the same way, were stored in the Laboratory for testing in a month's time. Though the storage period was for one month, it must be remembered that it was more than three months since this seed was harvested.

For convenience the definitions of "sprung" and "shot" are repeated. They are: "sprung" seeds are those in which the embryo has swollen with the absorption of moisture and has split the "skin" covering it; "shot" seeds are those in which growth has continued and the embryonic root and leaf can be seen.

The germination of shot wheat dropped so much during the month's storage that it is evident that such grain is valueless as seed. The sprung seed did not deteriorate to any extent, whether untreated or dusted.

The detailed results are as follows:—

Germination per cent. in 7 days of:—	Sprung wheat.			Shot wheat.		
	(a)	(b)	(c)	(a)	(b)	(c)
From South	78	80	75	21	30	20
From West	71	77	71	28	32	8
From N'th-west ...	73	82	80	14	19	10
Average Germination per cent. ...	74	80	75	21	27	13

(*a*) Untreated. (*b*) Ceresan dusted. (*c*) Copper carbonate dusted.

The germination of sprung seed was affected only slightly by either of the two treatments, and both dusts gave good control of moulds during the tests.

Shot seed, again, was adversely affected by dusting with copper carbonate, though germination of the untreated and Ceresan-dusted seed was so poor that the effect of the dust was immaterial.—AMY MYERS, Seeds Officer.

Business Names Act, 1934.

THE attention of farmers, fruitgrowers and others carrying on any class of rural business is drawn to the provisions of the Business Names Act, 1934, which requires registration to be effected in all cases where business is carried on under a business name, which does not consist of the surname of the proprietor or proprietors (together with his or their Christian names or the initials thereof), without any addition. Forms for registration may be had at the Registrar-General's Department, Sydney. The prescribed filing fee is 7s. 6d., provided that registration is effected before commencing business, otherwise the fee is 15s.

Any other information desired will be furnished on application to the Registrar-General, Sydney.

THE GRAND PARADE OF STOCK

This magnificent spectacle delights many thousands of onlookers each day of the show.

SYDNEY ROYAL SHOW, 1948.

Prizewinning animals in the beef and dairy cattle classes and the various horse classes are paraded and described for the benefit of spectators.

B.H.C. (BENZENE HEXACHLORIDE) AND MUSHROOM PESTS.

A Promising Means of Control.

G. J. SHANAHAN, B.Sc.Agr., Assistant Entomologist.

MORE effective methods of controlling the main mushroom pests, namely, mites (*Tyrophagus putrescentiae*), springtails (*Collembola*) and flies (*Sciara* sp.), are required. These pests can become troublesome when mushrooms are produced in the warmer months, and may actually be limiting factors in mushroom production.

Once mushroom beds become infested with insects and mites it is practically impossible to control them by the present available measures, which include spraying with nicotine sulphate or kerosene-pyrethrum fly sprays and fumigation with sulphur. In recent years some growers have been using the blow lamp to reduce the infestations of mites and springtails but serious damage to both the mushrooms and the mycelium can follow unless the beds are flamed over correctly.

Tests with B.H.C. indicate that this chemical is promising for control of these pests and that despite the characteristic musty odour of this chemical, beds can be treated with the toxicant without causing a foreign flavour to the mushrooms or interfering with production.

The possible value of B.H.C. for controlling mushroom mites was recognised when laboratory tests by the writer showed that B.H.C. dust was toxic to *Tyrophagus putrescentiae*, a Tyroglyphid mite which is often found in mushroom beds during the warmer months.

Before an experiment with B.H.C. against mushroom mites was conducted, Tarsonemid mites (probably *Pigmaeophorus americanus*, apparently previously unrecorded here) appeared in commercial growers' beds at St. Marys. The mites were present in plague proportions, forming colonies on the surface of the beds, and massing on clumps of the casing soil. It is reported* that this mite will not damage mushrooms, but feeds on the mycelium and hence can reduce or delay mushroom development.

The Tarsonemid mites practically disappeared from a bed which was dusted with 10 per cent. B.H.C. dust at the rate of 1 oz. to 6 square yards, whilst undusted beds remained infested with mites. Mushrooms, in the button stage, were present at the time of dusting and did not appear to be affected. When mushrooms in various stages of development were dusted at this rate to determine whether the B.H.C. dust would affect their appearance or flavour, no foreign flavour was was detectable in the cooked mushroom but a slight "burn" was noted on the dorsal surface. However, when mushrooms were deliberately overdusted the "burn" was easily noticeable in freshly picked mushrooms and might possibly detract from their market value.

A 20 per cent. B.H.C. dust which was applied at the rate of 1 oz. per 40 square feet successfully controlled the Tarsonemid mites, which appeared in limited patches in some 5,000 square feet of mushroom beds.

As Tyroglyphid mites, mainly (*Tyrophagus putrescentiae*) are usually the most serious mites associated with commercial mushroom growing, a preliminary trial was conducted with the same growers at St. Marys to determine the value of B.H.C. in preventing their occurrence, and to observe further whether this chemical would interfere with mushroom development. The trial was carried out in a brick building.

The experiment consisted of plots (9 feet x 4½ feet) which were dusted with either 2 oz. or 4 oz. of 10 per cent. B.H.C. dust. In addition 16 oz. of the dust were incorporated into the compost of a bed of similar size. Approximately 2½ cwt. of compost were placed into each plot which formed a flat bed of the dimensions given above and 4 inches deep. Each treatment was duplicated. The dust was applied with a screw-top jar with perforated lid. The casing soil was added about a week following treatment. Two control plots of similar size were kept.

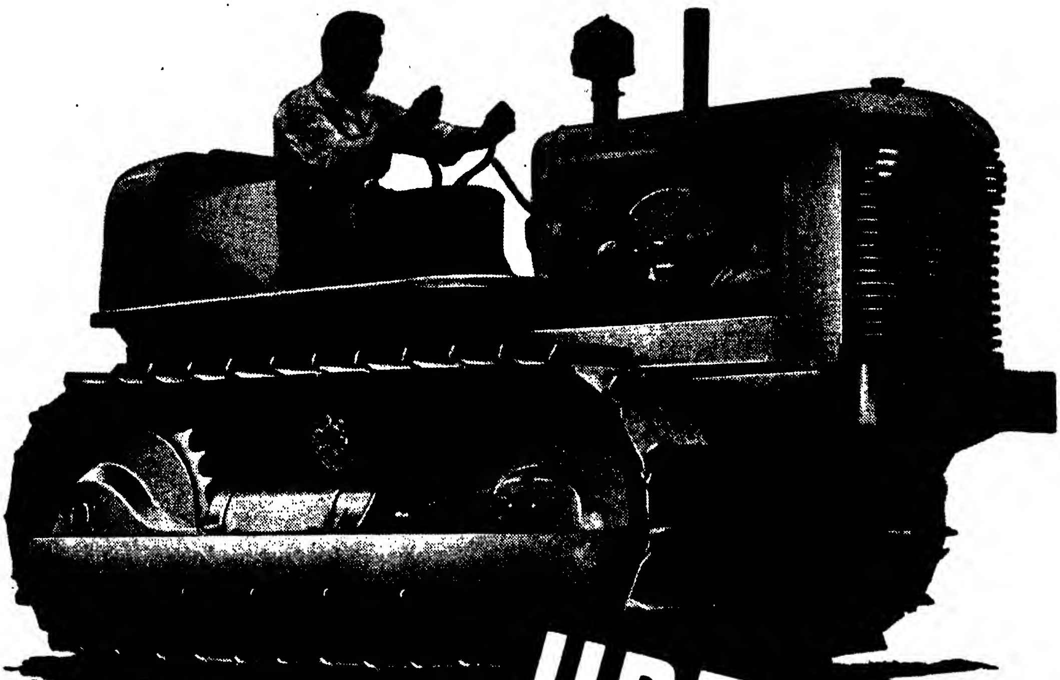
Tyroglyphid mites were practically absent from the treated beds, but since the mites did not appear in large numbers in the control beds, no conclusion can be reached from this test concerning the value of B.H.C. for Tyroglyphid mushroom mite control. However, the B.H.C. dust did not appear to inhibit the growth of the mushroom mycelium or to interfere with mushroom production or to cause tainting.

The effect of B.H.C. on springtails (*Onychiurus ambulans*) was also noted during this work. Springtails were immediately affected when beds bearing infested mushrooms were treated with a 20 per cent. B.H.C. dust at the rate of 1 oz. per 40 square feet. Live Springtails were absent from the surfaces of previously infested beds 24 hours after dusting with B.H.C.

In sections of the mushroom establishment, where the surfaces of the beds had been treated with 20 per cent. B.H.C. dust, at the rate of 1 oz. per 40 square feet, adult mushroom flies (*Sciara* sp.) were noticeably reduced.

The 10 per cent. and 20 per cent. B.H.C. (benzene hexachloride) dusts, which were used in this investigation, had a 1.3 and 2.6 per cent. gamma isomer content respectively.

* THOMAS, C. A., "Mushroom Insects—Their Biology and Control." Pennsylvania State College Bul. 419 (1942).



QUICK FREEZING OF FRUITS AND VEGETABLES
In U.S.A. and Canada.

S. M. SYKES, B.Sc.Agr., Fruit Officer (Research).*

THE relatively new process of quick freezing is a subject of popular interest to-day. From time to time, we read articles in newspapers and trade journals, which tell us what this method of preservation can do. The use of refrigeration and freezing as a means of storing food has been very familiar to most people for years, so that the question naturally arises—"What is so new about quick freezing, and in what way does it differ from the older concept of freezing?"

As the name suggests, quick freezing involves a rapid removal of heat from the product, whereas in other methods the period of freezing is considerably longer. Special equipment is required for this purpose and, in practice, the freezing unit becomes the final stage in a processing line which closely resembles that of a cannery. One of the most significant features of the new applications of freezing has been that many foods can now be successfully frozen, whereas previously only very poor products had resulted.

The quick freezing of fruits in small packages has arisen out of the freezing of fruits in barrels, which began about forty years ago. This bulk freezing is actually slow and the product is referred to as "cold packed" or "frozen packed" to distinguish it from the true quick frozen article. Cold packing is still carried on and represents a large proportion of the total frozen fruit output.

The commercial quick freezing of vegetables did not begin until the early 1930's and did not expand rapidly until about ten years ago. The recent progress achieved in the production of high quality frozen foods has been due, to a large extent, to the fund of technical information and experience that has been built up over a period of years. Many people in the fields of both research and industry have contributed to this advancement. One of the most outstanding figures has been Clarence Birdseye, who has been responsible for much of the progress in the commercial production of quick frozen foods. He is the inventor of the Birdseye Multiplate Froster, a freezing unit which is widely used in America.

* Mr. Sykes recently returned from an investigation of quick freezing methods in U.S.A. and Canada.

An Air-blast Freezer for Freezing Fruits and Vegetables.

[*Courtesy of Frick Co.*

Quick freezing preservation then means more than just the rapid removal of heat from the product. It implies that the product has been grown, selected, harvested, handled, prepared, frozen, stored and marketed in accordance with the best techniques which have resulted from research over the past thirty years.

The production of frozen fruits and vegetables in commercial plants represents the greater part of the industry to-day. However, there are two other phases which are steadily becoming more important. These are: (*a*) the use of locker plants for the freezing and storage of locally produced

Frozen Food Lockers in a Locker Plant.
[*U.S.A. Dept. of Agr., Misc. Pub.* 588.

foods; and (*b*) the home freezing and storage of foods in zero cabinets. While locker plants and home freezers are used mainly for meat freezing, the quantities of fruits and vegetables frozen by this means is quite considerable. In some country areas, where fruit and vegetables grow well, freezing preservation makes a significant contribution to the family food supply.

Importance of Quick Freezing to the Farmer.

To the man on the land, quick freezing is of special interest. Firstly, it is an additional outlet for agricultural produce. Any method of processing of raw material whereby it can be used more efficiently and marketed over a longer period of the year, is to the farmer's advantage. Secondly, it benefits him as a consumer of food. Too often, the diet of the rural family is lacking in variety and nutritive value. The development of locker plants and home freezers in America is doing much to improve conditions in this regard. Packaged frozen foods are also available in country towns, and the housewife may buy a supply of these foods and store them in the home freezing cabinet until they are required.

Since the success of quick freezing is dependent on the maintenance of high quality standards, the farmer has an important part to play in growing the raw material which will yield a quality product after processing. The use of the correct varieties, proper cultural operations, and harvesting at prime maturity are essential to the final quality of the frozen article.

The Position of Quick Freezing in America To-day.

Quick freezing is now a firmly established part of food processing in the United States of America. The total annual production of commercially frozen food is about 1,000,000 tons (exclusive of ice cream). In addition, about 500,000 tons is frozen in locker plants and home freezers. While these figures indicate a large quantity of food, the actual proportion of the total food consumed as frozen food is only about 3 per cent. The amount of fruits and vegetables frozen is still considerably less than the amounts which are canned or consumed fresh. However, production figures have shown a steady increase from year to year, and some people predict that quick freezing will eventually become the most important method of preservation.

The use of locker plants in both cities and country areas is still increasing. During the year 1945-46, the total number of plants in the United States of America rose from 6,000 to 7,000. Many reasons are suggested for this rapid expansion. The demand for better diets by rural families, the research and extension work by government experiment stations, the economy and satisfaction of this system of preservation, are some of the factors influencing the expansion. Home freezing in zero cabinets is growing, particularly in rural areas. Manufacturers planned to sell 1,000,000 home freezing cabinets in the ten-year period following the war. Agricultural experiment stations have been

fostering the home building of cabinets, and the larger models of "walk-in" freezers.

TECHNICAL DEVELOPMENTS IN QUICK FREEZING.

Raw Material.

The production of high quality fruits and vegetables in the field is now considered to be one of the most important parts of successful quick freezing. Much research has been directed to the improvement of strains and many new varieties have been developed for their special adaptability to freezing. A great deal of agricultural research is devoted to improvements in cultural technique, pest and disease control, and the more accurate determination of the correct maturity for harvesting. With regard to the latter point, freezing plants have a staff of field officers responsible for the supervision of the growing and harvesting operations. The harvesting of a crop such as peas for freezing, requires very careful observations by the field officer to determine when the crop should be cut, in order to give the best quality after freezing.

The term "quality control" is applied to that phase of plant organisation which is concerned with the maintenance of satisfactory quality standards. Some freezing plants place more importance on quality control in the field than in the plant itself.

Preparation for Freezing.

Practical experience and the results of research have shown that rapid handling after harvesting is essential to high quality. A recent tendency in many plants which process peas—a product which deteriorates rapidly after harvest—is to pre-cool the material immediately after the vining operation. If the peas must be held for some hours before processing, they are placed in a cold room at 32° Fahr.

Studies on the most desirable methods and times of blanching have provided processors with much information. The use of quality separators in pea processing lines is another development which exemplifies the trend towards higher and more consistent quality.

In the processing of fruits, the prevention of browning and off-flavours has been a major problem. Work is still in progress, but many outstanding successes have been achieved—notably in the use of ascorbic acid with peaches and other fruits, and in the improved use of sugar, both dry and as syrup.

Packaging.

The question of the most suitable container is still very much in the experimental stage. The containers are usually of paper-board construction, although there is some packing in cans and glass. Perhaps the best container to be produced to date in quantity is the "Canco" container (American Can Co.), which has a fibre-board body and metal ends. It has the advantage that it can be handled and closed entirely by machine, in a manner similar to that of a canning line.

New waxes and thermoplastics for the manufacture of moisture-proof containers and wraps have been also developed and are in the course of examination.

Refrigerated Trailer for Bulk Transport of Frozen Foods.
[*Courtesy of Birds Eye Foods, Canada.*

Freezing.

A great many different types of equipment are being used in the successful freezing of fruits and vegetables. The Birdseye Multiplate Froster has already been mentioned, and is the unit used by General Foods Corporation, the largest producer of frozen foods in the United States of America. The principle of this method of freezing is that of indirect contact with the igerant. The packages are placed between refrigerated metal plates which are brought into close contact with the packages.

Air blast freezing is widely used in a variety of ways. Frequently the packages or loose product are spread on trays which are placed on trucks. The trucks are then placed in a tunnel through which air at about — 30° Fahr. is blown. Another type of air blast freezer is commonly used for a free flowing product like peas. Here, the prepared material is fed on to a slowly moving mesh belt. As the material passes through the various stages of the tunnel, cold air is blown through the belt and food. By the time it reaches the discharge end, it has been frozen and the temperature reduced to 0° Fahr.

A small number of plants use the method of freezing by direct contact with the refrigerant. Some form of this method may, in time, prove to be one of the most efficient of freezing techniques, but, so far, there has been no completely satisfactory application of the principle to practical working conditions.

Refrigeration and constructional engineers are carrying out research to develop machines which will enable frozen foods to be produced more efficiently and economically.

Transport and Marketing.

The distribution of frozen foods is a special problem, since the products must be held at a temperature of 0° Fahr. from the time they come out of the freezing unit until they are ready to be thawed and consumed. Completely satisfactory rail transport has not yet been achieved, and much of the refrigerated road transport is doubtful. However, these links in the production chain of frozen foods are gradually being strengthened and will help to raise the quality of the food as it reaches the consumer.

The retail handling of frozen foods in shops is a phase of the distribution problem which has been in the past, and is still, a serious limiting factor in the expansion of the frozen food industry. The type of sales cabinet has been improved considerably but the cost is still high. Thus, the capital outlay on retail cabinets represents quite a large proportion of the total costs.

Quick Freezing in New South Wales.

Quick freezing in New South Wales is, as yet, a very small industry. Only one plant is in operation and there are very few stores which retail frozen foods to the public. Many difficulties must be expected in the early stages of development. The education of grower, processor, cold store operator, retailer and consumer is, in itself, a major task. The expansion of electric power in country areas, the provision of refrigerated transport and storage, and the manufacturing of freezing cabinets are some of the factors which will influence the growth of the industry. Agricultural and other technical research will be necessary, and is being undertaken by the New South Wales Department of Agriculture and the Council for Scientific and Industrial Research, Division of Food Preservation.

As a new outlet for agricultural produce, quick freezing will be regarded with interest by the primary producer. For the consumer, it is a possible means of raising the quality and variety of the family's food and of ensuring a continuity of supply. The high acceptability and fresh-like flavour of properly-prepared frozen foods is sufficient reason for assuming that they will, in time, have a definite place in the Australian diet.

[In subsequent articles Mr. Sykes will deal in detail with various aspects of the quick freezing process.]

Approved Vegetable Seed—April, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Varieties Listed—continued.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, "Sherwood Farm," Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Hunter River Brown—R. C. Morandini, Box 74, Dubbo.

Hunter River Early—D. J. Thrift, "Linga Longa," Branxton.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day H. P. Richards, "Sovereignton," Tenterfield.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Gloucester (Mrs. M. A. Newton)	April 9, 10
Macksville (D. Turner)	April 9, 10
Barraba	April 9, 10
Horsley (J. A. Siggers)	April 10
Bellingen (C. P. Francy)	April 12, 13
Coonabarabran	April 13, 14
Orange	April 13, 14, 15
Wallamba	April 15, 16
Wauchope	April 15, 16
Grafton (C. W. Creighton)	April 15, 16, 17
Gunnedah	April 15, 16, 17
Hawkesbury District (Clarendon) (T. J. Cambridge)	April 15, 16, 17
Boggabri	April 20, 21
Baradine	April 20, 21
Wellington	April 20, 21
Maclean (C. W. Done)	April 21, 22
Forbes (E. R. Woods)	April 23, 24
Gresford	April 23, 24
Narrabri	April 23, 24
Urbenville (S. Stoddart)	April 23, 24
Wee Waa	April 28, 29
Dubbo	April 29, 30, 31, May 1
Dungog	April 30, May 1
Bonalbo	April 30, 31, May 1
Coonamble	May 4, 5
Trangie	May 4, 5
Warren	May 11, 12
Walgett	May 13, 14
Gilgandra (A. Christie)	**May 18, 19**
Nyngan	May 19, 20
Sydney Sheep Show	June 2, 3, 4, 5
Cootamundra Sheep Show	June 15, 16
Condobolin (G. L. Maxwell)	August 10, 11
Trundle (W. A. Long)	August 17, 18
Weethalle	August 18
Lake Cargelligo	August 20-21
Peak Hill (H. J. Dawson)	August 24, 25
Wagga	August 24, 25, 26
Grenfell	August 27-28
Barellan	August 28
Parkes (L. S. Seaborn)	August 30, 31, Sept. 1
Lockhart	August 31, September 1
Young	August 31, September 1
Ungarie	September 1
Deniliquin	September 3, 4
Murrumburrah	September 3, 4
Cowra	September 7, 8
West Wyalong	September 7, 8
Narrandera	September 10, 11
Barmedman	September 11
Finley	September 11
Forbes Sheep Show	September 11
Canowindra	September 14, 15
Temora	September 14, 16
Hillston	September 15
Ardlethan	September 18
Leeton	September 21, 22
Quandialla	September 22
Hay	September 24, 25
Ariah Park	September 25
Bribbaree	September 29
Cudal	October 1
Illabo	October 2
Griffith	October 5, 6
Walbundrie	October 6
Singleton	October 7, 8
Culcairn	October 9
Cootamundra (D. H. Boyd)	October 15, 16

The Growing of Watermelons.

A Popular Summer Vegetable.

◆

A. C. ORMAN, H.D.A.,
Special Agronomist.

WATERMELONS are one of the most popular summer vegetables. They may be grown successfully in most districts—except the highlands where the season is too short and temperatures too low for best results. Warm coastal districts situated in the Central and North Coast divisions, as well as inland districts west of the Dividing Range, provide the most suitable conditions for the crop. Watermelons are readily destroyed by frost and are severely checked by cold changeable weather.

The most suitable climate is one that has a long period of warm frost-free weather which is not subject to sudden fluctuations in temperatures, and is relatively free from cold westerly and southerly winds in the late spring. High temperatures are essential for the production of good quality melons. Although the moisture requirements of the crop are not excessive, it is important that an adequate and uniform moisture supply be maintained in the soil throughout the growing period.

Soils and Preparation.

Rich, deep, well-drained alluvials are generally regarded as the most suitable soils for watermelons. Virgin soils are particularly suitable. Sandy soils in warm situations produce the earliest crops and the best quality melons.

The soil should be prepared over as long a period as possible. For best results the first working should be given not later than the winter. Work the soil 8 or 9 inches deep, and reduce it to a fine. moist condition just prior to sowing. Well-rotted farmyard manure, if available, should be thoroughly incorporated with the soil during the final preparation.

Sowing the Seed.

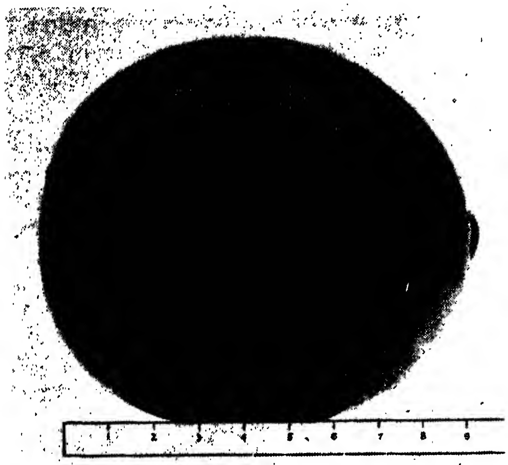
The seed is usually sown on the square, in groups or hills spaced 10 or 12 feet apart each way. In the drier districts, where irrigation is not available, a wider spacing is desirable. About eight seeds are sown 1 to 2 inches deep in each group. When the plants are well established they should be thinned to three to the group. The seed may also be sown in drills spaced 12 to 15 feet apart, and the plants thinned to about 8 feet apart in the drill.

Under no circumstances should sowing take place until the soil is warm enough to ensure a satisfactory germination and the danger of frosts has passed. Germination may be hastened by shooting the seed, just prior to sowing, between two damp bags placed in a warm position. The seed should be sown when the seed coat splits at the end.

Early crops may be obtained by propagating the seedlings in earthenware pots, boxes, etc., and subsequently transferring them to the field when danger from frosts has passed. Sowing is carried out about six weeks before the normal time for sowing in the field and the containers should be

placed in a hot bed to promote germination and growth of the seedlings. When transplanting it is necessary to remove the whole block of soil from the container, taking care not to injure the roots of the seedlings.

Fertilisers are recommended for most soils. Rich soils may only require superphosphate applied at about 4 cwt. per acre,



An Angelino Melon.

but most coastal soils should be fertilised with a complete fertiliser at 8 cwt. per acre. The fertiliser should be thoroughly incorporated with the soil prior to sowing.

Watermelons should be cultivated frequently from emergence until the vines prevent further cultivating, to control weeds and conserve moisture. Irrigation should be given when necessary to keep the crop growing continuously.

Varieties.

Hawkesbury Wilt Resistant is the most popular melon grown for commercial purposes. The melons are oblong, with light greyish green and darker green netted markings. The rind is thick and tough, the flesh is medium to deep red, sweet and fine textured.

Hawkesbury Wilt Resistant is a heavy yielder of large melons, averaging about 35 lb. in weight. The variety is highly resistant to Fusarium wilt. It is very suitable for transport over long distances.

Market Wonder, which is an improved Kleckley's Sweet, is a favourite for local market and home consumption. The melons are large, long, cylindrical with a dark green skin. The rind is medium thick and the flesh bright red, crisp, and of excellent quality and flavour. It is a heavy yielder and transports fairly well. It is similar in appearance to Kleckley's Sweet but somewhat larger and more suitable for market. It is susceptible to wilt.

Early Canada is popular because of its early maturity and relatively good quality. The melons are oval to round in shape and of medium size; the skin colour is a light green. The quality is good. This variety is synonymous with Early Yates, Early Sugar and Early Surprise. It is suitable for early production. The most suitable variety for growing in Tableland districts.

Angelino.—There are black-seeded and white-seeded strains, which are identical in

Black-seeded Chilian Watermelons.

all other respects. Fruit is oval to round and of medium size, skin very dark green. The flesh is dark red, of attractive appearance and excellent eating quality. Angelino is an excellent variety for the home garden but not very suitable for transport; it is very susceptible to wilt.

Chilian.—There are two strains of this variety, black-seeded and white-seeded, the former being the more popular. The outside colour is dark green with darker green stripes. The flesh is bright red and the rind thin and tough. Chilian is fairly early maturing and very suitable for the home garden; it appears to do particularly well in inland districts.

Other varieties are Kleckley's Sweet, Sugar Stick, and Klondike; the first two have been largely superseded by Market Wonder and Hawkesbury Wilt Resistant respectively.

Harvesting.

Ripeness may be determined in several ways. Change of colour, especially of the portion of the melon which rests on the ground, is a useful guide, the colour changing from white to creamy yellow at maturity. The rest of the melon usually changes to a dull colour as maturity approaches. A hollow sound when the melon is rapped with the back of the hand denotes immaturity, whereas a heavy dull sound indicates ripeness. The dying of the tendril at the stem end is also a sign of maturity. The smooth appearance and the total absence of hairs on the stem which attaches the melon to the vine is also taken as a guide by some growers. However, the knack of telling a ripe melon comes with experience.

Pest Control.

The most serious pests are aphids and pumpkin beetles. The former should be controlled by spraying the vine with nicotine sulphate 1 fluid oz., white oil emulsion 6 fluid oz. to 4 gallons of water. Pumpkin beetles may be controlled by dusting the plants with derris dust or calcium arsenate 1 part mixed with 16 parts hydrated lime. Hydrated lime alone may be dusted on the plants to repel the beetles.

Bathurst Experiment Farm—New Manager Appointed.

MR. F. F. FILAN, Agronomist of the Division of Plant Industry, has been appointed as Manager, Bathurst Experiment Farm.

Mr. Filan entered the Department in 1938 as Assistant Agrostologist. He was stationed first at Leeton Experiment Farm, primarily to investigate the most suitable strains of pasture plants for irrigation conditions, the best pasture mixtures for grazing on the Murrumbidgee Irrigation Area, watering problems of irrigated pastures, and the most suitable fodder shrubs and shade trees for that part of the State.

During the war Mr. Filan acted for a considerable time as Experimentalist and as officer in charge of the plant breeding work at Leeton. For the last two years of his term at Leeton, he was engaged mainly in production of vegetable seed, in which capacity he constructed and operated machines for threshing and preparing the first crops of vegetable seed grown at that Farm.

From 1943 to 1947, Mr. Filan acted as Fertiliser Rationing Officer for the Department.

Departmental Dairy Herds.

Transferred to Control of Division of Dairying.

CONTROL of the Department of Agriculture's stud dairy herds has been transferred from the Division of Animal Industry to the Division of Dairying.

Commenting on this change, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said that owing to the close relationship between production, herd testing, feeding and breeding of dairy cattle, it had been considered that transfer of these herds to the Division most concerned with the dairying industry would allow of better co-ordination of this work.

This re-organisation, Mr. Graham continued, should make it possible to extend the departmental herd recording scheme, to carry out sire survey work, to collect herd wastage figures, and in co-operation with other Divisions of the Department, to conduct feeding experiments. Scientific feeding of cows was recognised widely as one of the most important measures towards improved production, and it had been considered that the Division of Dairying, with its close contact with dairy farmers, was admirably equipped for extension work on feeding. Arrangements had been made to appoint additional staff to the Division.

THE SEPARATOR AND THE COW.

Each Requires "Supply" and "Maintenance."

J. W. DAVISON, Dairy Officer.

Mr. DAIRY FARMER,—Have you ever compared a separator and a cow? You would be surprised if you considered them in a broad way, to observe just how much they have in common.

Provided the separator is supplied with milk (or fed) and it is maintained in good mechanical condition and operated at correct speeds, it will continue to produce cream from the milk, but will cease to do so when one of two things happens—(*a*) mechanical breakdown occurs; or (*b*) milk supply is cut off.

Now let us look at the cow. While she is fed a satisfactory ration (supplied) and properly cared for (maintained) she will continue to yield up to her capacity of milk, but will cease to do so when something happens to one or other of these essentials.

Year after year in New South Wales too many cows "break down"—or cease to produce—as the result of the equivalent of mechanical breakdown of the separator; that is from the effects of disease and from physical factors such as damaged udders and other causes which the dairyman can think of.

No matter how well the herd is maintained, occasional troubles will develop which are beyond the control of the farmer, yet it is evident that the proper handling of milking machines, insistence upon milking hygiene and the non-stripping of machine-milked cows is gradually bringing about a lessening of udder troubles.

The dairy farmer has to provide his cows with adequate grazing or he has to hand feed either in a supplementary way or totally if his cows are to produce efficiently. When he is unable to do this, the cow is like the separator from which the supplies are cut off.

Normally there is no production problem in periods of ample rainfall. Green pastures and grazing crops are the best possible sources of food supply, but when the benefit of rain is lost the story changes. Production drops, and very often cows lose condition; if short wet spells intervene many cows fail to respond—they are busy building up condition. In other words, "supply" becomes spasmodic and the "machine" (in this case the cow) fails to produce efficiently.

Such conditions are reflected in factory production—the sudden surpluses or shortages in milk supplies to the Milk Board, and the drop in production in western areas, once the spring flush has passed.

To Extend Production in the Central-West.

By the end of December in normal seasons, production in the Central-West is negligible. There is no spread in production. This drop in yield often coincides with the necessity to concentrate all labour on harvesting. It appears that for some years to come labour shortages will be a limiting factor in production in this area.

The feeding of small quantities of good concentrates in the bails from the middle of December to the end of March, however, or even the provision of good lucerne hay in racks would do much to off-set the drop in production during the dry months of the year. It would certainly help to prevent the premature drying off of cows—thus extending their production.

If the lactation period of 6,000 cows could be extended for only one month into the autumn and such cows averaged 25 lb. butter-fat for the month, an extra 180,000 lb. of commercial butter would become available for export.

THE BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics

GROWERS' LOSSES AT CITY MARKTES.

THE problem of the losses occasioned, not only to growers and agents but to retailers also, in the marketing of fruit and vegetables at the City Municipal Markets, is one which has been causing concern to the Department of Agriculture for some time. These losses are mainly caused by faulty selection, packing and grading of products on the farm, and become evident not only on arrival at the Markets but later in retail stores. They can thus be traced back to the grower.

The Division of Marketing and Agricultural Economics maintains a Markets Advisory Service for the benefit of growers. In co-operation with inspectors from the Export and Import Branch of the Department, and officers of the City Council, daily losses due to bad marketing practices are checked, and growers are informed by telegram of the facts of their loss and the causes for the rejection of the product in the market. Hundreds of telegrams have been despatched since this service was inaugurated.

Quantity and Value of Vegetables Condemned in 1947.

As an example of the economic importance of marketing losses, the accompanying table shows the total losses, in hundredweights, for twelve months ended December, 1947, of vegetables condemned at the City Municipal Markets. The figures quoted refer only to vegetables in respect

QUANTITIES OF VEGETABLES CONDEMNED AT SYDNEY MUNICIPAL MARKETS, 1947 (cwts.)

Vegetable.	Jan.	Feb.	Mar.	April	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Peas	53¼	16	3¼	11½	46	19	1	38¾	¼	3¼	1½	1¼	195¾
Beans	63½	35¼	33½	24¾	216	38	18	50¾	7½	17¾	9¾	1	515¾
Tomatoes ...	107¾	133	150¾	186	531½	53¼	175½	50¼	335¼	37¾	15¼	495¾	2,272
Cabbages ...	367	14	...	30	20	...	90	...	6	...	...	...	527
Carrots ...	76½	472	333	15¾	213¾	...	3½	4½	139½	5½	73¼	82	1,419¼
Parsnips... ...	...	63	74	...	70	...	...	...	80	42	24	...	353
Sweet Potatoes	2	...	10	10	35	...	22	...	50	53	114	...	296
Pumpkins ...	...	10	...	25	...	...	37	25	6	...	4	...	107
Swedes	...	5	...	...	33¾	72	102¼	7¾	11¼	36	...	1½	269½
Cucumbers ...	106¼	43	3¾	1¼	2	2	2½	10½	...	...	1¾	9¾	182¾
Lettuce	1¾	¾	...	...	10½	...	...	...	...	...	...	...	13
Marrows, Squash	3	...	...	...	...	...	2¼	...	...	...	...	...	5¼
Beet	...	16¼	...	...	...	...	...	...	...	...	...	...	16¼
Brussels Sprouts	...	...	...	...	254	...	1	1	3½	1¼	...	...	260¾
Potatoes ...	...	...	...	...	...	...	...	...	...	...	...	31¾	31¾

GRAND TOTAL ... ... 6,473½ cwts.
= 323.75 tns.

of which condemnation certificates were issued, but do not include other incidental but considerable losses.

To secure the full picture of the extent of this loss, the quantities have been valued at the average monthly price, after an adjustment between the ratios of weight used in giving prices and condemnations. The following is the approximate loss on each vegetable for the whole year:—

Vegetable.	Total Loss.	Loss to Grower.
	£	£
Peas...	526·6	473·9
Beans	1232·9	1109·6
Tomatoes	5770·1	5193·0
Cabbages	210·5	189·4
Carrots	992·1	892·8
Parsnips	318·2	286·3
Sweet Potatoes	208·3	187·4
Pumpkins	44·8	40·3
Swedes	124·8	112·3
Cucumbers	174·1	156·6
Lettuce	19·0	17·1
Marrows, Squash	1·9	1·7
Beet	2·2	1·9
Brussels Sprouts	1060·3	954·2
Potatoes	15·8	14·2
TOTAL	£10,701·6	£9,630·7

Of the total loss of £10,702, it is considered that growers lost £9,631, or 90 per cent., and that 10 per cent. is a fair average of losses borne by people other than growers. The deduction of 10 per cent. allows for agent's commission, freight, cartage and miscellaneous costs.

Causes of Losses.

What are the causes of these losses at the markets due to condemnation?

In the case of tomatoes, the causes of the condemnations—to which growers in New South Wales, Queensland and Victoria contributed—were mainly immaturity and disease. Decay was the cause of carrot losses; large quantities from North Coast districts failed to withstand transport conditions and often arrived in an unsaleable state; another factor was overstorage in cool-rooms. Losses of peas and beans were the result of sweating, disease and the marketing of over-mature lines. With pumpkins and sweet potatoes losses generally were the result of decay, but the marketing of immature sweet potatoes also played a part. The large quantity of cabbages condemned during January was a consignment which arrived in a "yellowed off" and unsaleable condition from an inland district.

It is evident that in most cases these marketing losses are the result of negligence and/or bad judgment on the part of the grower.

Hints on Preparation for Market.

The following hints on preparation of produce for market are offered as means of reducing the present great waste and loss:—

1. It is essential to harvest at the correct stage of maturity. The actual time of harvesting should be related to the time elapsing between harvest and probable sale and the prevailing temperature.

2. Grading and culling before packing are essential. All diseased, insect-infested, damaged, over-ripe and mis-shapen produce must be removed. Good grading for quality establishes a sound reputation for the product and causes it to be sought by buyers, thus ensuring reasonable prices, and grading for size is essential with standardised lines.

3. Food which is offered to buyers in a condition of deterioration, or is decayed or bruised, is at a disadvantage in comparison with a better quality product. This is especially the case when prices are low—very often such produce then becomes virtually unsaleable.

4. Boxes, cases or other containers should be in good order, especially if the produce is to travel a long distance.

Better Methods Mean Greater Returns.

It is in the grower's own interests to attempt to market the highest possible quality product. A large proportion of low-grade produce offering on the market has a depressing effect on the prices for better-class lines.

While it is recognised that wastage occurs and will continue to occur as the result of circumstances over which the grower has no control, it is felt that losses can be reduced by growers giving attention to certain essentials in harvesting, packing and transporting their produce.

Better marketing methods not only mean greater returns to the producer, but also ensure that vital foodstuffs reach the consumer in good condition.

If in turn, wastage is reduced in retail stores, there are better chances of cheaper fruit and vegetables to the consumer, with greater satisfaction all round.

The Future of the Citrus Industry.

CONCERN is being expressed within the citrus-growing industry at the extent to which expansion of citrus planting is taking place. Remunerative markets during the war years have led many growers to take an optimistic view of the future prospects of the industry. The important questions are: To what extent are new areas being planted? How far is this expansion justified in the light of future requirements?

In an attempt to estimate the actual extent of new plantings, a survey of New South Wales was made by this Department in 1946. It was estimated that within the three years 1947-49 total new plantings of citrus in New South Wales would approximate 5,420 acres. Of this total new area, 3,920 acres would probably be planted privately and 1,500 acres possibly under soldier settlement schemes. It was also estimated that, in addition, 3,112 acres of a total 5,212 acres of unhealthy or declining citrus would be replaced.

A report by the Bureau of Agricultural Economics, Canberra, places Australia's annual requirements by 1956 at 9.6 million bushels. The present annual demand is about 6.9 million bushels. Estimates of additional annual requirements of 2.7 million bushels were based on the probability of a population increase of 14 per cent., an improvement of 30 per cent. over pre-war nutrition standards, and increased exports to New Zealand amounting to 200,000 bushels per year.

On the basis of present plantings and likely replacements, citrus production in Australia by 1956 should approximate 7.8 million bushels. Therefore, to meet total requirements by 1956 production would have to be increased by 1.8 million bushels. On the basis of an average yield of 250 bushels to the acre, increased plantings up to 7,200 acres would, on this reasoning, be indicated.

Suggested expansion of citrus area for New South Wales is 2,500 acres. The Bureau regards this area as the safe limit for total expansion. Government sources consider that this area could be regarded as the limit for War Service Land Settlement alone.

Thus with total probable new plantings amounting to 5,420 acres, assuming other States plant full quotas, it would appear that expansion of production beyond the market capacity is possible within the next few years. This would mean low prices generally, and unstable and glutted markets.

Opportunities for Increasing Demand.

As the State has no power to restrict the area of citrus planted, the industry must, therefore, seek to increase consumption of citrus fruit, both on the home and oversea markets. There is ample opportunity yet for increasing consumption per head of citrus in Australia—the consumption rate is not up to nutritional requirements.

Several factors influence levels of consumption of fruit—some within and others beyond the control of the growers. The main factor which the producer cannot influence, and which determines the upper limit of consumption, is the general standard of living. With higher incomes, increasing proportions of food expenditure are spent on such protective foods as fruit, which are necessary for good health but are not essential to mere existence.

Within the control of the grower, however, are factors which can have considerable influence on demand. The industry should aim at maximum efficiency in production and distribution in order to produce a high quality product at a minimum cost which can be sold at a price to bring the product within the purchasing range of relatively low income earners. Fruit produced on healthy, well-cared-for trees gives the grower high returns.

The Bureau of Agricultural Economics states that in New South Wales unhealthy or declining trees comprised 19 per cent. of the total area of bearing Valencias, 23 per cent. of the total area of bearing Washington Navels, 40 per cent. of the total area of other bearing oranges, 27 per cent. of the total bearing area of lemons and limes and 19 per cent. of the total bearing area of grapefruit. Considerable areas, therefore, are past the period of profitable production either as a result of normal decline in productivity or inefficient orchard management. The presence of such trees in an orchard depresses the average production per tree for the whole orchard, thus tending to increase average costs. Moreover, the poor quality fruit produced from poor trees not only commands a low price

on the market but also tends to depress the general price level on the market.

Production of high quality fruit in itself is not sufficient. The producer must see that his fruit is properly graded, packed and marketed. In a primary industry such as citrus growing the grower as an individual, is powerless to control the market for his product. Thus it seems desirable that producers co-operate with each other in the marketing of their product. By doing so, improvement of quality, grading, standardisation of lines and attractiveness of the pack is facilitated, and obvious economies are gained as a result of handling of large quantities. Care in packing and grading and insistence on quality would help eliminate the factor of price depression caused by low grade, unsaleable fruit on the market, in addition to increasing the consumer's demand for the product.

Oversea Markets.

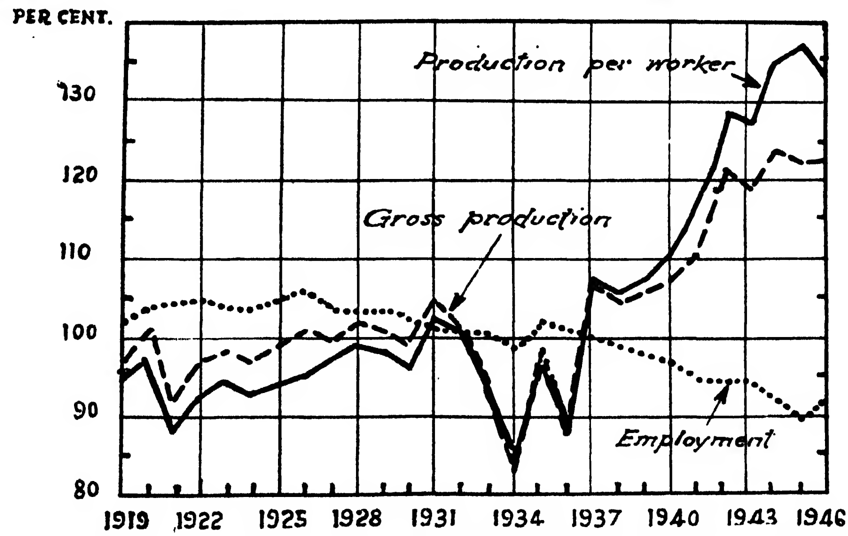
If we are to increase our markets for citrus overseas, it is essential that we consider the demands of those markets. Australia's share in some markets was restricted or even declining before the war as a result of the preference for the American product due to higher quality, greater sweetness and greater uniformity of packing and grading.

There should be no problem of over-production if growers aimed at efficiency of production, better organization of distribution and marketing of a quality product at minimum cost and low price to the consumer. While war-time demand allowed for high returns for all types of fruit, attention to quality packing and marketing procedures was not of vital importance. When demand slackens and prices fall as has already occurred for lemons this season, these considerations assume first importance.

A Revolution in Farming.

THE Bureau of Agricultural Economics of the United States Department of Agriculture has recently been giving attention to the significance of some of the changes which have taken place in American agriculture during and since the war. The results achieved in these recent years are considered to justify the view that a full-scale agricultural revolution has occurred, and not just a temporary or small-scale change.

What is the nature of this revolution in farming? Briefly, it is a revolution in productivity. Today American farmers are producing over one-third more products for the market than they did before the war. And they are doing it with fewer workers (10 per cent. less in 1945) and little increase in lands used for crops and pasture. This increase in agricultural production is, therefore, far more important than that in indus-



Graph showing Gross Farm Production, Farm Employment and Gross Production per Worker, United States, 1919–46.

try, because, in the latter case, plant capacity and labour supply both increased enormously.

Only a fraction of the agricultural increase can be attributed to favourable weather conditions. For example, in 1945, when the weather was not so very favourable, a new record was set. It is necesasry to look for other causes.

The essential cause was the direct result of the quick adoption by farmers, from coast-to-coast, of new and better ways of doing the job. What were the improved methods used?

Mechanisation.

First, and by far the most important, was the tremendous advance in mechanisation. At the end of 1946 the number of tractors on farms was over the 2,000,000 mark, which was double the number in use as recently as 1936. By 1950, it is expected that 2½ to 3 million units will be in use. Today, more than a third of farmers have tractors compared with only 14 per cent. in 1930. There has been widespread adoption of the general-purpose tractor adapted for smaller farms, and a wide variety of uses. Machines have been designed in scores for special jobs, and they have required tractor rather than animal power.

The main point is that this large scale adoption of mechanisation has come in this last decade. And the trend will continue while farm incomes remain high. Already, the demand for newer and better corn pickers, combines, pick-up hay balers, field choppers, cotton pickers, flame weeders, sugar-beet planters, etc., is forcing supply and leading to still further advances in use and design. Mechanisation is reducing the time required for farm operations. Today, a corn farmer can prepare and plant three acres of land with tractor and power equipment in the time previously required to do only one acre with animal power.

Fertilizers.

The second aspect of improved methods has been the greatly increased use of fertilizer and lime. Farmers are now using about twice the amount of fertilizer and three times the amount of lime used a decade ago. Further big increases are expected in the immediate future. Greater use of fertilizer and lime, together with the cumulative benefits of better soil management of the past ten or twelve years, have contributed to a procession of one yield record after another in practically all the major crops.

Improved Crop Varieties.

Third in the important forces bringing about the revolution in agriculture is the unprecedented adoption by farmers generally of improved crop varieties in recent years. Hybrid seed corn is the outstanding example. In the last ten years the acreage planted with hybrid seed has jumped from a mere 5 per cent. to over two-thirds of the total corn acreage. Because yields from hybrid seed are about a fifth more than from open-pollinated, 3-billion-bushel corn crops have become the rule rather than the exception.

Similarly, farmers have been using higher-yielding, more disease- and weather-resisting varieties of oats, wheat, potatoes, tobacco, cotton, legume hays, soybeans, peanuts, flax-seed and many fruit and vegetable crops.

The War Hastened These Changes.

The technological advances in mechanisation, use of fertilizer and lime, improved crop varieties and soil conservation had only begun to appear at the outbreak of war. They had been developing for several years and would probably have come in time in any case. But it was the war, and the incessant demand for farm products that gave the process its revolutionary character.

It is in speeding up the technological changes that farmers have revolutionised the productive capacity of agriculture. They have increased the production per acre by a fifth in the past decade, the output per worker is over a third more, gross production of all agricultural products is at least a fourth greater and production of commodities for human use in one-third more (see graph).

The continuation of American economic prosperity is the key to greater productivity in agriculture.

PLANT DISEASES.

WOODINESS OR MOSAIC DISEASE
Of Passion Fruit.

C. J. MAGEE, D.Sc.Agr., M.Sc., Chief Biologist.

THE woodiness or mosaic disease is one of the principal handicaps of the passion fruit grower, and has been for many years. The short life of plantations is mainly due to this disease and to severe outbreaks of Brown Spot, which may defoliate a plantation. Profitable cultivation of passion fruit, in spite of the disease, is at present dependent upon the provision of cultural conditions unfavourable to the Woodiness virus.

The woodiness disease of passion fruit is so called because of the characteristic effect the disease has on the skin or rind of the fruit, typical specimens having a thickened, woody rind and a reduced pulp cavity. Affected fruits are undersized and misshapen, and sometimes spherical. This last feature, together with the hardness and often leaden colour of the fruits, has given rise to another common name for the disease, namely, "Bullet."

In spite of the prominent fruit symptoms, the woodiness disease is primarily a disease of the vine. It is a mosaic disease, caused by an infectious virus and has certain characteristics in common with other well-known virus diseases, such as tomato mosaic, tomato spotted wilt, potato leaf roll and banana bunchy top.

Some plant diseases are caused by pathogenic fungi, *e.g.*, brown spot of passion fruit, black spot of citrus, wheat rust; others by pathogenic bacteria, *e.g.*, bacterial blight of beans, crown gall of fruit trees; but another important group of diseases is caused by viruses. In the case of virus diseases, no visible pathogen can be detected, even with the use of a microscope, but the sap of diseased plants is infective and certain species of insects which feed on the sap are able to transmit the disease to healthy plants. Thus, with woodiness it is possible to transmit the disease by introducing the sap from diseased vines into healthy ones and certain species of aphids can also spread the disease.

Symptoms of the Disease.

The effect of woodiness virus on the vine is very varied, ranging from no easily visible effect to severe stunting and yellowing. Seasonal conditions largely determine the severity of the disease and symptom picture, but age and vigour of vines also have a pronounced influence on the symptoms seen. Severely affected vines have a stunted and obviously unthrifty appearance. The internodes or distances between leaves are shortened, giving a bunched effect. The leaves of the terminal shoots (see Figs. 1 and 2) are smaller than normal and are malformed, puckered, curled and twisted. On closer examination it is seen that such

Fig. 1.—Terminal Shoot of Passion Fruit showing Mosaic Symptoms.
Leaves are malformed, have translucent venation and green blisters on the upper surface.

leaves are either pale-yellowish-green or have a mottled (or mosaic) appearance, due to the presence of light-green and dark-green areas. These symptoms are most readily

Fig. 2.—Terminal Shoot of Passion Fruit from a Woody Vine showing Stunting and Malformation of Growth made during Cool Weather.

observed in old vines, but they may be seen in less pronounced form in young vines and even in young seedlings.

In the late autumn and winter small, clear, yellowish or membranous areas may be seen in the developing leaves at the apex of young shoots. These are tissues weakened by the virus, and as the young leaves grow some of the areas collapse, leading to malformed leaves. If large areas of the young leaf are involved, complete lobes of the leaf may be missing as a result. The curling, twisting and puckering of leaves results from unequal stresses arising from tissue losses and from increased growth of the dark-green areas of the leaf compared with that of the yellowish areas. The dark-green areas often appear as green blisters on the upper surface of the leaf. Slit-like perforations are frequently found in leaves, particularly in the areas between the three main veins. The fine venation of leaves is "cleared" or more translucent than normal.

Another leaf symptom is sometimes seen if a flush of growth occurs in young vines in the late autumn as the result of rain. Small, rounded, yellow spots or flecks (Fig. 3) may appear in the younger mature leaves of terminal shoots. If these spots are numerous they may coalesce to form a bright yellow area on the leaves. The yellow spots or areas are superficial and later disappear as the leaves age.

When present, woody fruit (Fig. 4) is a striking symptom, but many diseased vines carry normal fruit at some period of the year, and in many localities develop little or no woody fruit during the first few years of growth. The woody character may be observed in fruit at all stages of its development, and is due to an abnormal thickening of the rind. The thickening results in a small pulp cavity and restricts growth of the rind so that affected fruits often crack. Fruits on diseased vines also may be marked with a series of fine dots or stipples, and occasionally may show a series of ring-like patterns in addition to developing a thickened rind. In some cases projecting lumps (Fig. 4) may be present on the rind, but these should not be confused with somewhat similar lumps resulting from fruit fly stings.

The symptoms of the disease are most in evidence during the late autumn, winter and early spring. This relationship to seasonal conditions is so pronounced that formerly cold winds and frosts were thought to be

Fig. 3.—Roundish, Yellow Spots and Flecks caused by the Woodiness Virus.

Seen in young vines which make rapid growth in the autumn.

entirely responsible for the abnormal growth of the vines. It is now known that the activity of the virus which causes the disease is greatly favoured by low temperatures

(daily means of 50 to 60 deg. Fahr.) and that higher temperatures tend to "mask" or minimise its effect on the vines. Thus vines which have made vigorous growth in the summer and early autumn, with little or no sign of abnormality, may receive a severe check when cool weather sets in and the new growth may show mosaic symptoms. The fruit that sets during the cool weather may be woody. When there is fluctuation in the weather, as commonly occurs at the change of seasons, this also may be reflected by abnormal foliar and fruit symptoms in the new growth made during the cool snap. Thus several woody fruits may be found on canes with normal fruits on either side. During the cooler months of the year the terminal growth of most passion fruit vines in New South Wales shows mosaic symptoms, the severity depending upon the age of the vine. With the return of warm weather in the late spring and summer, the activity of the virus is again masked and if the vines are vigorous, normal foliage and fruit are again formed (Fig. 5).

Besides the striking temperature relationship just referred to, age of vine, inherent vigour of individual vines and soil fertility greatly influence the amount of debilitation the virus may cause. Thus vines entering their first winter at 6-9 months of age, generally suffer less and make a better recovery than those of 18-21 months, and the effect of the virus increases and the degree of recovery after winter decreases as the vines age. In most plantations certain individual vines show more pronounced symptoms of the disease from the outset and usually show marked symptoms of the disease even during the summer months. Soil fertility, the use of nitrogenous fertilizers and shelter of plantations from cold winds each seem to play a part in restricting the debilitating effect of the virus and conversely, the disease appears to be more destructive in poorly sited or neglected plantations and in those exposed to cold winds.

Cause of the Disease.

The virus which causes woodiness or mosaic disease is that known as *Cucumber virus 1*. This virus is transmitted from diseased to healthy plants by several species of aphids including *Myzus persicae*, *Macrosiphum solanifolii* and *Aphis gossypii*. The virus is the cause of a number of common mosaic diseases, in New South Wales, of vegetable and ornamental plants. Many common weeds are also affected by the virus.

Whether or not the woodiness virus is transmitted in the seed of passion fruit is still unsettled. Seed transmission by this means seems probable because of the very early appearance in seed beds of abnormal foliar symptoms which cannot reasonably be accounted for as arising from aphid transmission. Such symptoms are more pronounced in autumn-sown seed beds than in seed beds sown in the late spring, or those raised in glasshouses.

The proof of seed transmission is difficult because of the ease with which the virus is masked in seedlings by moderately warm

Fig. 4.—Misshapen and Woody Fruit Appear on Many Vines during their Second and Later Years.

The fruit set during the cooler months of the year is the most likely to be woody.

Fig. 5.—Young Vine Photographed in Mid-summer showing, on the Lower Portion of stem, Malformed and Ruffled Foliage Representing the Effect of the Virus in Cool Weather, and, on the Upper Portion of Vine Summer Type Foliage.

temperatures and the apparently low concentration of the virus in seedlings. Under plantation conditions, however, all plants are found to be infected with the virus at an early stage of growth. Surveys reveal that by the time vines are fit for tying to trellises, they show unmistakable signs of mosaic, or leaf abnormalities typical of the disease.

The effect of virus on the seedlings varies. Under warm conditions and good cultural attention, most seedlings make satisfactory growth, but some from the outset continue to display mosaic symptoms and fail ever to make good vines. These vines are the first to develop woody fruit and often do so during their first crop. Most other vines do not bear woody fruit for two or more years.

Control Measures.

On the basis of past experience, there does not appear to be any prospect, in the present state of knowledge, of preventing the woodiness or mosaic disease from eventually affecting every plant in a plantation. Thus, the only measures that are likely to be of value are those aimed at restricting its severity and prolonging the productive life of a plantation in spite of the disease. Summed up, they are directed at masking the virus by the provision of favourable growth conditions for the vine.

1. A warm site should be selected for the plantation with a northerly aspect and maximum shelter from southerly and westerly winds. The most successful plantations in the past have been those located on well drained soils of high fertility. These have been mainly virgin soils. Thought must therefore be given, where a permanent passion fruit area is under consideration, to the maintenance of soil fertility by green cropping, crop rotation, and erosion control.

2. Transplant the vines early in the summer rather than late in the summer or in the autumn, so that the vines are well grown before cold weather sets in. Maximum growth should be fostered by the use of animal manure, fertilizers and any necessary watering.

3. A limit must be accepted for the profitable life of a plantation. Usually this will be from three to four years. Some growers have found it most profitable to plant a new block of passion fruit every year and to determine the future of any aged block by its disease condition at the end of the summer crop. Often the amount of Brown Spot (*see* Plant Disease Leaflet No. 14) present will decide the issue irrespective of the woodiness disease. Areas to be replanted in the following summer should be put under a green crop (lupins and oats) during the late autumn and winter. It is still considered advisable to destroy old vines some time before planting a new block in close proximity, as it is believed that secondary infections occur from old blocks. Better control of brown spot in the new block is also likely to be obtained if this is done.

4. Relatively heavy dressings of fertilizer should be given in the spring and summer (details of fertilizing passion fruit are given in a leaflet issued by the Department of Agriculture).

5. Vines should not be pruned back in the late autumn, winter or early spring as this will induce growth during a period of the year when the virus will reach a high concentration and give the plants a severe

(*Continued on page* 208.)

INSECT PESTS.

Notes contributed by the Entomological branch.

CABBAGE MOTHS (*Plutella maculipennis*) AND CABBAGE WHITE BUTTERFLIES (*Pieris rapae*).

THE caterpillars or grubs of the common cabbage moth and the caterpillars of the white butterfly have been recorded developing in large numbers and causing considerable damage to cabbages and cauliflowers.

In addition to these plants the caterpillars may also cause serious damage to other plants belonging to the family Cruciferae, such as Brussels sprouts, kohl-rabi. radish, turnip, mustard, sweet alyssum, garden stocks and wallflowers.

The Cabbage Moth.

The adult is a small moth which measures about 3/8th inch in length. It is of a greyish-brown colour and when at rest, with folded wings, shows a row of angular yellowish markings down the centre of its back.

The minute, disc-shaped eggs, which are pale-green or yellowish, are usually laid singly, generally on the under-surfaces of the leaves. The young larvae, for the first two or three days after hatching, eat small pieces of the leaves. The outer leaves become perforated, but as the plants age the caterpillars feed mainly on the more tender centre leaves. Where the infestation is severe and control measures are neglected, the centre layers of the plants become covered with fine webbing, and the hearts eaten through and fouled with excrement, the whole plant being rendered unfit for human consumption.

The fully-fed caterpillar, which measures about ½ inch in length, is very active, and when disturbed wriggles quickly away, or may drop to the ground or hang suspended by a silken thread. The caterpillar eventually spins a flimsy, lace-like cocoon, usually on the under-surface of one of the leaves or amongst the heart leaves, and within this cocoon enters its pupal or chrysalis stage. The pupa is green at first, but becomes brown before the adult emerges.

The incubation period of the eggs varies from three to six days; the larval period occupies from nine to twenty-eight days, and the pupal period from five to thirteen days. The complete life-cycle from egg to adult thus varies from seventeen to forty-seven days.

Control.

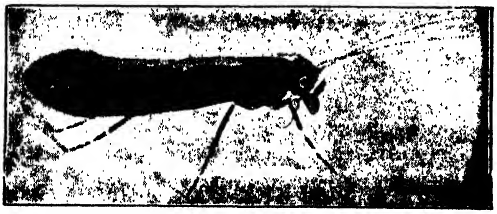
Clean cultivation is an important factor in the control of this and most other crop

Cabbage Leaf Damaged by the Caterpillar of the Cabbage Moth.

The caterpillars and their cocoons are to be seen on the leaf.

(Reduced about half actual size.)

The Caterpillar or Grub of the Cabbage Moth.



The Cabbage Moth showing the Diamond-shaped Markings on the Back.

and garden pests. Attention should therefore be given to old seed-beds which are likely to harbour the moths, and, later in the season, all cabbage and cauliflower butts and unsaleable plants remaining after cutting, should be cleaned up to prevent the pest from breeding and infesting later crops.

For cabbages, cauliflowers and Brussels sprouts, both in the seed-bed and after transplanting, D.D.T. dusts and sprays may be used to control the caterpillars.

The dust recommended consists of a 2 per cent. D.D.T. powder; and the spray a D.D.T. emulsion, diluted to give a concentration of 0.1 per cent. D.D.T., *i.e.*, D.D.T. emulsion (20 per cent.), 2 pints; water, 50 gallons (3 fluid oz. to 4 gallons).

In the seed-beds, the plants should be treated each week, and after planting out, every seven to fourteen days, according to the amount of infestation.

To avoid the danger of the hearts carrying undesirable D.D.T. residues, *treatment with this chemical must cease as soon as hearting commences, and at least four weeks before cutting. Cauliflowers must not be treated with D.D.T. after the curd commences to form.*

If it is necessary to control cabbage aphids also, then H.E.T.P. (hexa-ethyl-tetra-phosphate), an effective alternative insecticide to nicotine sulphate, may be used. The concentration required is H.E.T.P., 1 fluid oz.; water, 12½ gallons (1:2,000).

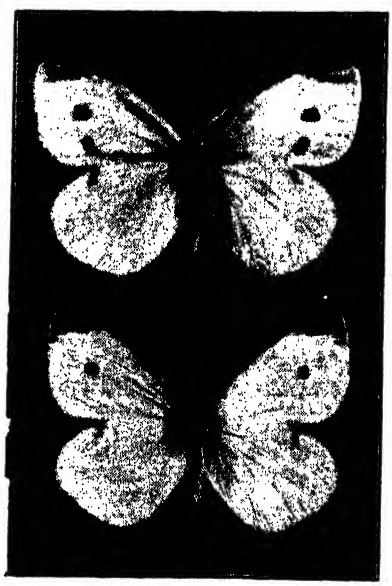
The Cabbage White Butterfly.

The caterpillars of this butterfly, in addition to feeding on plants belonging to the family *Cruciferae*, may also attack mignonette (family *Resedaceae*) and the garden nasturtiums (family *Geraniaceae*).

The butterflies are frequently seen flitting amongst, or hovering over, the blossoms of various plants where they obtain nectar, and this leads many people to believe that they are infesting these plants as well.

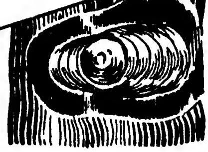
This butterfly has a wing-expanse of about 2 inches and the ends of the forewings are marked with black or grey. The female has two black spots on each forewing, and one at the front margin of each hindwing. The male, which is somewhat smaller, has only a single spot on each forewing and one on each hindwing. The hindwings beneath are distinctly yellow, the forewings being somewhat paler.

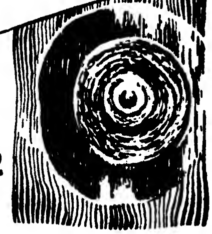
The yellowish, spindle-shaped eggs are laid singly, usually on the underside of the outer leaves of the food-plants. The caterpillar which, when fully-fed, measures about 1¼ inches in length, is velvety-green with a faint yellowish stripe down the back and along each side. Its body surface is covered



The Cabbage White Butterfly.
Above: Female. *Below:* Male.

PROTECT YOUR FRUIT CROP with NEPTUNE SPRAYING OILS . . .

1 

2 

3 

SAN JOSE SCALE: *1—Adult Male Scale. 2—Adult Female Scale (both greatly magnified). 3—Scales on pear, indicating red discoloration.*

SPRAY CALENDAR . . . April

CITRUS

Red Scale—Neptune White Spraying Oil.

Pink and White Wax Scales—Neptune White Spraying Oil and Washing Soda.

PRUNING

While pruning, watch for San Jose, Mussel and other Scales, also Red Spider and Mites, Woolly and other Aphids, etc. . . . **and ensure dormant control** of pests by ordering now your requirements of the following Neptune Sprays—

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with fine hairs and minute black protuberances.

The pupa or chrysalis, which measures slightly more than ½ inch in length, varies in colour and may be grey, yellow or green. It is attached by its tail to a silken pad, and its body is supported by a fine, silken girdle around the middle. The pupa may be attached to the food-plant or to some nearby object, or even to debris on the ground.

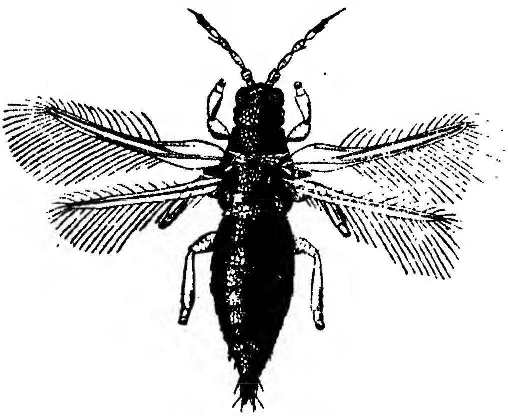
Control.

Where the methods recommended above, for the control of the cabbage moth, are adopted, little damage is likely to be caused by the caterpillars of the white butterfly.

The Black Thrips (*Heliothrips haemorrhoidalis*).

THIS thrips has been particularly numerous during the past few months, and has been found causing extensive damage to the foliage of many kinds of plants. It commonly infests various ornamental shrubs and fruit trees, and azaleas, fuchsias, hydrangeas, dahlias, passion vines, persimmons, etc., have been injured.

The black thrips feeds principally on the foliage of the plants, usually in compact colonies, on the undersurfaces, and rapidly causes the characteristic silvering and mottling of the leaf-surfaces, on which are to be seen the typical brown and black spots of excreta. In later stages of infestation the thrips may feed on the upper-surfaces of the leaves. Where citrus trees are infested, the hanging fruit may become extensively silvered, particularly where it is closely overhung by leaves.



The Black Thrips. [*After Weigall.*

The adult thrips, which measures about 1/20th inch in length, is dark-brown to black, with the end of the abdomen lighter, and, although winged, it rarely flies.

The eggs are inserted in slits made in the plant tissues, and all stages, including both the prepupal and pupal, are passed on the infested plants. The immature thrips are white at first, but later become yellowish, and these may be found feeding in association with the black adults. A number of generations occur during the year and the life-cycle from egg to adult occupies about five weeks.

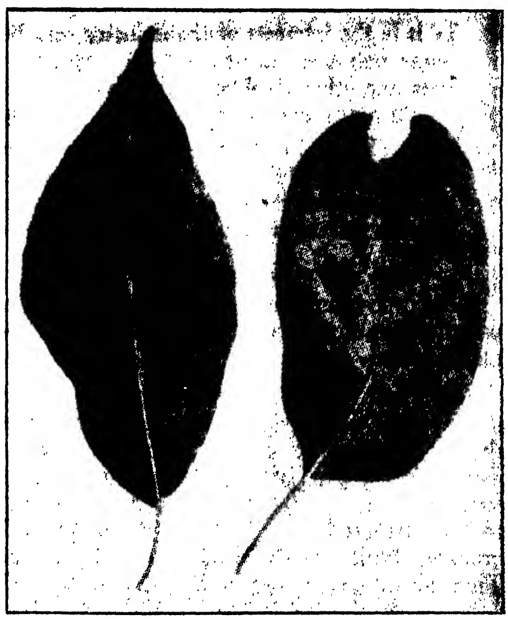
This thrips prefers shady, cool and fairly moist conditions; hot, dry weather and heavy rain adversely affect it in the open.

Control.

This thrips may be controlled by spraying thoroughly with a D.D.T. emulsion used at a dilution of:—

D.D.T. emulsion (20 per cent.), 1 pint.
Water, 25 gallons.
(3 fluid oz. to 4 gallons.)

As the eggs of this species are laid within the plant tissues, they are protected from sprays, and, therefore, a second treatment should follow the first after about an interval of two weeks.



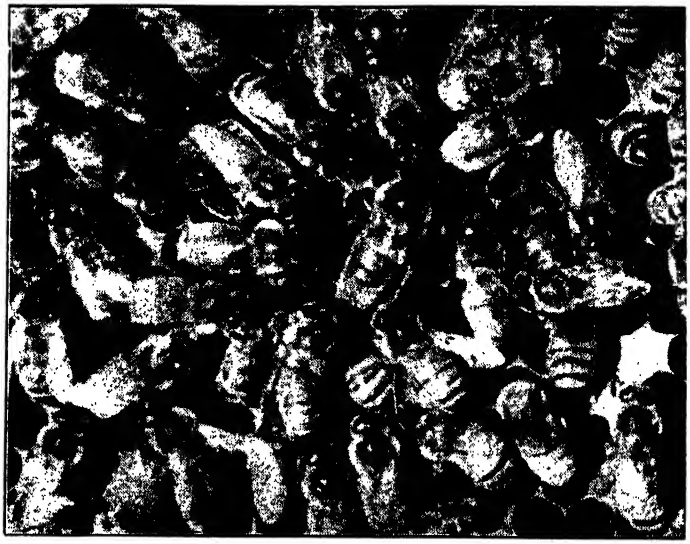
Leaves Showing Typical Thrips Injury. [*After Bailey.*

APIARY NOTES.

The Value of Public Goodwill to the Beekeeper.

Avoid Cause for Complaint.

D. L. MORISON, B.V.Sc., Apiary Branch.



Queen Bee Surrounded by Attendants.

IT is in the interests of the industry that beekeepers retain the goodwill of the public, for many apiarists are dependent on various members of the community for use of apiary sites and other facilities. The development of an antagonistic attitude to the beekeeper would make conditions difficult, especially where large properties are concerned.

Where hundreds of hives of bees are kept in towns and villages, as is often the case in New South Wales, it is understandable that some individual complaints will be made that the bees constitute a nuisance. When investigating such complaints, the Department has in some instances found them justified, whilst others were not fair or reasonable.

Some Complaints Are Justified.

The following are typical of instances in which investigations proved that the complaints were justified:

(*a*) Bees were found to be causing damage on two irrigation areas where the drying of fruit is carried out extensively. Particular types of grapes, dipped in a special solution, on being placed on drying racks, attracted bees in large numbers and cracked fruit on the racks was damaged. This occurred during a dearth of natural supplies in the fields.

Beekeepers should note that provision is made in the Apiaries Act 1916-1944, Section 12C, to control the keeping of bees at certain periods in special fruit-drying areas where complaints are found to be justified.

(*b*) An apiary situated alongside a school ground was found to be a source of discomfort to the teachers and scholars, through swarms of bees alighting on trees during spring; in addition horses used by the children were kept in the grounds.

The position was explained to the beekeeper, who decided on the recommendation

of the Department to move his bees to another site. The Department is usually successful in arranging an amicable settlement of such problems as this.

(*c*) Investigation of a complaint by a beekeeper's neighbour that his children had been stung, revealed that the beekeeper had established his hives just over the dividing fence and opposite to where the children played games.

There was ample room for the hives further back on the beekeeper's yard, and where trees would force the bees to take a higher flight. On recommendation of the Department the hives were moved back—a few feet at a time, as is necessary in such cases—and no further trouble has been reported.

It will be seen from these instances that with some forethought on the part of the beekeeper and a little goodwill on the part of a neighbour, these need be very few justifiable complaints about the keeping of bees in towns and villages.

The Department Will Mediate in Disputes.

The legal position in respect to the keeping of bees, has been stated by the Legal Officer of the Department as follows:

"The Local Government Act, 289, empowers a Council to control and regulate the keeping of animals (bees) within a municipality. Again, in Collins, Martin and Bluett's 'Local Government Law and Practice,' p. 606, legal opinion is expressed that a Council could by resolution prohibit the keeping of bees within a reasonable radius of a public place."

However, a few years ago the problem of complaints about bees constituting a nuisance was fully discussed between representatives of the Department of Agriculture, the Commercial Apiarists' Association of New South Wales, the Local Government and Shires Association, and the Department of Local Government. It was decided, at this meeting, that complaints made regarding bees constituting a nuisance are to be dealt with as an individual matter. The Department of Agriculture is advised of any such complaint in order that it may be investigated and an opportunity given to arrange an amicable settlement of the trouble.

Dealing with individual cases in this way means that the general industry is not affected. So far this arrangement has worked very well and it is hoped that Councils and beekeepers concerned in complaints will continue to co-operate in the interests of the bee-farming industry.

Unavoidable Causes of Complaint.

There are cases, of course, in which bees cause trouble for which neither the beekeepers nor the Councils can accept any

Mr. A. Yeo, of Ashfield, in his Apiary.
This beekeeper is interested in making apiary observations in co-operation with the Department.

responsibility. Such an instance occurs when travelling swarms of bees find lodgings in the walls or other parts of a house. The swarm may have come quite a distance —miles on occasions—before lodging in the building. Where they cannot be removed without damage to the building the Department recommends that some D.D.T. dust be blown into the cavities which the bees are occupying; this will soon destroy them.

Complaints, too, are received from the proprietors of cake shops that bees are gaining access to icing on cakes. During adverse conditions in the fields bees may come from several miles away for this

purpose, and the obvious preventive measure is for the shopkeeper to screen his premises to exclude both bees and other insects interested in the goods on display.

Precautions with Animals.

Animals such as horses, cattle, dogs, etc., are liable to be attacked by bees when roaming about in areas in which an apiary is established. Horses, because of their nervous temperament, are probably the most likely to be stung. However, provided they are not confined in a small enclosure, or tied up near the apiary, they quickly get away from the hives and no harm is done. It is very seldom that any casualties occur when animals are free to get away.

It is not unusual to see cattle feeding amongst the hives without being disturbed at all, as they do not exhibit any degree of nervous temperament. However, if they knock the hive or disturb the bees at the hive entrance they may be forced to leave in a hurry. A dog will only become inquisitive about bees working on one occasion; afterwards, it gives the apiary a very wide berth.

Points the Beekeeper should Observe.

In order to avoid as much as possible the likelihood of bees becoming a nuisance to others with consequent detriment to the interests of the industry, beekeepers should be careful to observe the following precautions:—

(1) Place bees at a distance from the usual traffic routes. That is, do not place bees near gates or other places where people and stock are compelled to pass close to the hives as this may result in unnecessary stinging.

(2) Do not place bees close to the main stock routes or watering places, since this may disturb stock watering. Even when the bees are some distance away from a watering trough, the beekeeper should provide an adequate and independent water supply near his apiary.

(3) Beekeepers, especially those located in closely populated areas, should keep a relatively quiet strain of bee and re-queen any temperamental colonies.

(4) Migratory beekeepers should not leave truck loads of hived bees standing in the main street of the town. Several such instances have come to the notice of the Department, and bees escaping have caused considerable annoyance to the townspeople. Beekeepers should park their truck loads of bees in a side street or, better still, outside the town altogether if bees are escaping from the hives.

(5) Do not carry out apiary operations which will excite the bees unduly if there is a danger of the bees causing a nuisance. For example, do not extract honey when the flow has cut off and the bees are inclined to rob, if there is a chance that animals or people in the vicinty will be attacked.

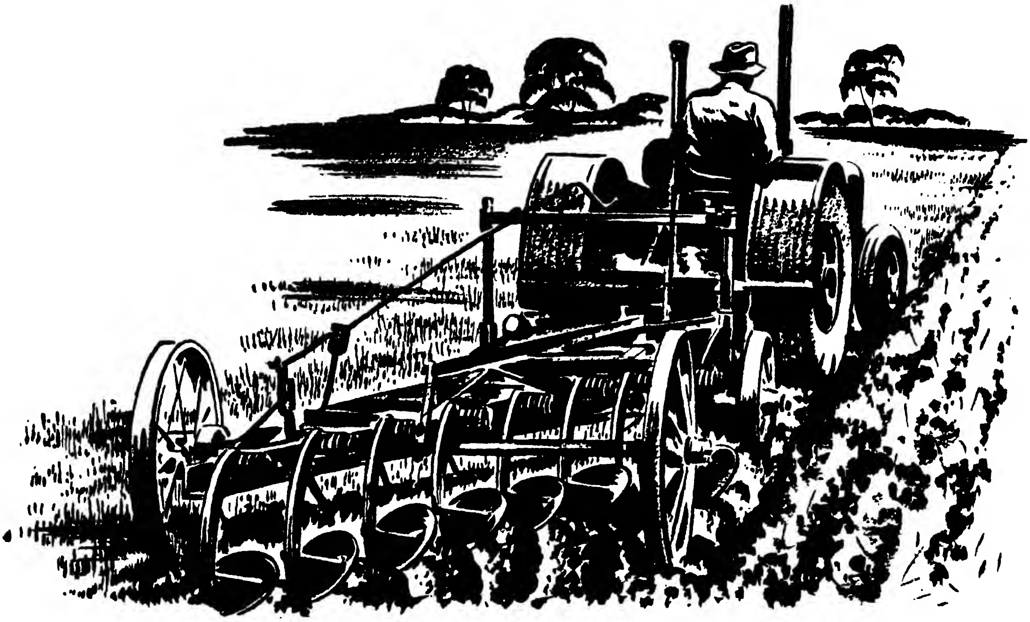
(6) Keep bees in a quiet corner of the suburban yard to avoid possibility of complaints. Very often a judicious distribution of honey to neighbours likely to be disturbed will prevent any pettiness.

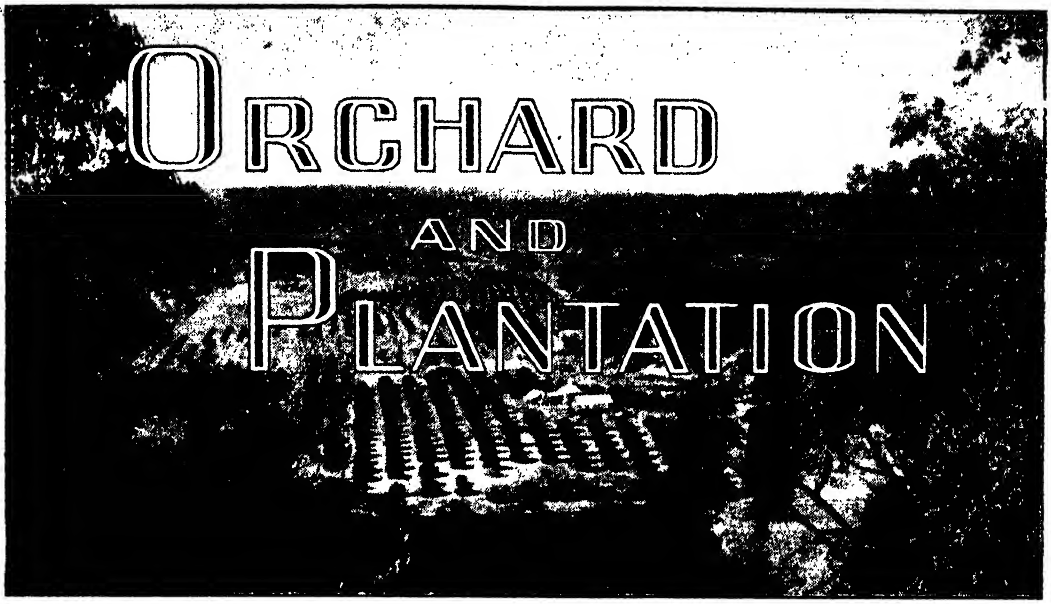
Plant Diseases—*continued from page 202.*

setback. If vines are heavy in foliage at the end of the summer crop, spraying for control of brown spot should be continued during the autumn and winter, and cutting back delayed until the advent of warm weather in the spring.

6. Investigations are in progress with a view to the field selection of strains of passion fruit which are more tolerant to the virus than most seedlings. These will need to be propagated as rooted cuttings or by budding on to rootstocks.

7. Householders who grow a few vines for home use are advised to plant a new vine in a warm site early in every summer and to fertilize and water it well. Old vines should be discarded at the first signs of becoming unproductive.





APPLE TREE PRUNING SYSTEMS.

Trials at Bathurst Experiment Farm.

VALUE OF MODERATE TREATMENT.

J. D. Bryden, Special Fruit Officer.

INVESTIGATIONAL work conducted at Bathurst Experiment Farm concerning methods of pruning apple trees has shown that a system of moderate pruning treatment is superior to either severe pruning or light pruning. When Granny Smith trees were constantly pruned from time of planting under methods varying from very severe to an annual light thinning, it was found that moderate treatment achieved best results, whether measured by growth and vigour or by yield and cropping potential.

In comparatively recent years varying degrees of modification in apple tree pruning have been advocated. In some instances it has been suggested that apple trees require practically no pruning and that the trees should be allowed to develop as they will. In others moderate pruning to effect some control of the tree and some regulation of the bearing wood has been advised, while in some instances it was thought that severe pruning was necessary to shape and form the tree and maintain vigour.

Observation of the effects of severe, moderate and light pruning treatments were commenced at Bathurst Experiment Farm in 1934 on newly-planted Granny Smith trees on seedling stocks, and interesting comparisons can now be made of the results to date.

The trees included in the trial are growing in a light granite soil 9 to 10 inches deep overlying a gravelly clay of medium-light texture.

During the period 1934-46 seasonal conditions varied considerably, and many prolonged dry periods were experienced. The average annual rainfall for the years 1934 to 1946 inclusive was 20.73 inches, which is somewhat lower than the long-term average. The highest annual rainfall was 27.96 inches recorded in 1943, but much of this was received as heavy summer storms and was of little value to the trees. The lowest rainfall

occurred in 1944 when 10.4 inches was recorded. The trees were not irrigated.

Granny Smith trees on each of three stocks, viz.: Granny Smith seedling, Yate's seedling and seedlings of unknown origin, were used for each pruning treatment. Details of observation and data concerning growth and yields were recorded in each case, and the average results for each pruning treatment determined.

The following table shows details of average tree growth, size and production of the various treatments:—

sive effect of severe pruning constantly practised. This system disregards entirely the inter-relationship between size of top (amount of foliage) and extent of root system in the tree, and the necessity for balance between the two.

In these trials, Granny Smith trees which have been severely pruned for thirteen years are small by comparison and have borne only small crops of medium- to large-sized fruit. The severe pruning kept the trees in a healthy and vigorous condition but retarded development. The vigour and growth

Average Tree Growth, Size and Production for Several Pruning Treatments.

Pruning Treatment.	Increments in Trunk Measurements from Planting.			Trunk Measure 1947.	Size of Tree 1947.		First Crop.	Progressive Total of Yields.		
	5 yrs.	10 yrs.	13 yrs.		Height.	Width.		5 yrs.	10 yrs.	13 yrs.
	mm.	mm.	mm.	mm.	ft.	ft.		Bus.	Bus.	Bus.
Light	191	398	441	487	13·6	12·5	1939	1·00	7·65	15·65
Moderate	168	380	436	480	12·6	13·1	1940	—	7·25	22·83
Severe...	154	359	412	455	10·5	8·8	1941	—	3·00	7·5

The small size and low yields from severely-pruned trees, and the loss of vigour reflected in the yields of lightly pruned trees after reaching ten years of age, are outstanding features of the trials.

Severe Pruning.

In many instances, it has been the practice to obtain the shape or form of tree considered most desirable because of convenience and economy by resorting to severe pruning while the framework was being built.

In addition, it was considered necessary to prune the leaders severely to force growth, the aim being to furnish the limbs completely with smaller spur formations. Severe pruning was also necessary in order to keep the spurs close in to the limbs, and this meant that laterals must be almost completely suppressed after being brought out only 4 to 6 inches from the limbs.

The trials at Bathurst have shown that severe pruning has many disadvantages, and that these outweigh any supposed advantages, mainly because the same objects could be achieved by more moderate treatment.

The chief disadvantage is the slow development of the tree caused by the suppres-

was excessive and was obtained at the expense of crops.

Light Pruning.

Advocates of light pruning of apple trees claim that such a system results in more rapid growth and a larger tree, together with earlier cropping. These claims are partly true, but such developments do not give an accurate indication of the ultimate behaviour of trees pruned under such a method.

In the tests at Bathurst, light pruning consisted of a general light thinning, with leaders unpruned, while the framework was being built. Subsequently, as the tree approached the fruiting stage, the laterals and fruiting wood were pruned slightly harder, but the treatment was still within the category of light pruning. As the tree developed the leaders were generally unpruned, although individual leaders were shortened in cases where this was necessary for symmetry and balance.

The treatment had the effect of inducing rapid growth and development during the early years. At five years old the trees were twice as big as those receiving moderate

A Granny Smith Apple Tree Eleven Years Old, Lightly Pruned Since Planting.

pruning and very much larger than the severely pruned trees. Fruit bud development occurred in the fourth year, and the lightly pruned trees produced a small crop in the fifth year. Subsequent development was less rapid, although the trees continued to show moderate vigour until about ten years of age.

After this stage, however, the trees made very little lateral growth and became spindly and weak in the top. Each year the trees showed less vigour, became more sparsely foliated, and here and there throughout the trees sections of limbs became denuded of spurs.

Granny Smith Tree Severely Pruned Since Planting. At eleven years old.

At thirteen years old these lightly pruned trees are difficult to handle, are of an inconvenient size and shape for orchard operations, while the cropping potential is considerably less than trees receiving moderate treatment along orthodox lines.

Moderate Pruning.

Moderate pruning is the pruning treatment recommended by the Department. The method comes midway between the extremes of severe and light pruning.

In this system, primary and secondary leaders are shortened by about one-third, secondary limbs are encouraged and the trees are furnished with strong fruiting arms which are subdivided and have vigorous growth beyond the fruit. The fruiting arms are formed by shortening strong laterals not too severely, and then proceeding to extend

A Eleven-years-old Granny Smith Tree which has Always Received Moderate Pruning Treament.

and subdivide them through subsequent laterals.

In the tests, trees which were moderately pruned were sturdy and vigorous during the early years and showed steady development. During the first eight years these trees were a contrast to the larger, lightly-pruned trees and the smaller, severely-pruned ones. At ten years from planting, however, moderately pruned trees had approximately the same bearing area as those lightly pruned and were then almost equal in total yields.

The trees have continued to develop under the moderate treatment and at thirteen years of age are superior in every way to trees receiving other treatments.

A Planting Policy for the—

CANNING PEACH INDUSTRY
In the Murrumbidgee Irrigation Area.
THE VARIETAL ASPECTS.

B. OWEN FRENCH, B.Sc.Agr., H.D.A., Fruit Officer (Research), and A. E. VINCENT, Fruit Inspector.

BECAUSE of the perishable nature of its raw product, the canning peach industry requires that very close co-operation, almost to the degree of absolute dependence, shall exist between the canning factory and the peach grower; the closer the policies of the two interests can be integrated the greater will be the efficiency of the industry.

Each of the two sections of the industry has certain limitations and essential requirements, and on particular issues their interests will, at times, run counter to each other. The stability and efficiency of the industry as a whole are dependent upon the establishment of a mutually satisfactory balance between the interests of both. Any lack of balance between the land use programme of the region supplying the canning factory, or factories, and the canning factory's capacity and requirements must result in loss to either or both interests.

Just such a problem of balance has developed in the Murrumbidgee Irrigation Areas during the past ten to fifteen years. During this period the planting policy has been determined by the farming requirements of high yields and the need for a minimum of cultivation, with the result that the Golden Queen variety has received over-emphasis in the planting programme and farm production is now definitely out of step with cannery requirements.

Early Planting Policy.

In the early days of the canning peach industry, a fairly wide range of varieties was grown. As experience has accumulated over the past fifteen to twenty years, however, the industry has gradually become dependent on three varieties, viz., "Phillip's Cling," "Golden Queen," and "Pullars Cling," which ripen in that order, and the acreage of other varieties such as "Levis," "Palora," and "Sims" has gradually decreased. The nett result has been that while total production has been increased, the harvesting period has been gradually shortened.

The Phillip's Cling variety, while an excellent peach from the canning angle, has certain disadvantages in the field, particularly in regard to pruning, which have resulted in a reputation for light cropping—and the variety has consequently gradually lost favour. While ripening somewhat earlier than the Golden Queen, it is not sufficiently early to make this characteristic of much consequence on a district basis, and as a result there is a fairly substantial overlap in the peak harvest periods of the two varieties. In fact, even on individual farms, because this variety hangs very well, its harvesting is often delayed until after the first rush of the Golden Queen harvest.

Golden Queen has proved to be an outstanding peach from the point of view of both the grower and the canner. It bears large crops of good size, high quality fruit which stands up to processing well. The tree is easily handled and is not unduly susceptible to any disease occurring locally. Its main weakness is a tendency to drop at maturity.

Pullars Cling is a very satisfactory variety from the point of view of the grower, but owing to a red pit and centre, it is somewhat less favoured by the canneries.

To date all other varieties tested commercially have shown some serious disability which has resulted in their exclusion from the planting programme. Thus Levis pro-

duced small fruit which ripened so suddenly as to create serious harvesting difficulties, and the variety Sims, also producing small fruit, had a definite tendency towards alternate cropping; Palora and Selma produced only small crops of small fruit and were particularly susceptible to peach rust.

As a result of the outstanding quality of Golden Queen, growers have concentrated on it to such an extent that in 1946-47 this variety represented over 49 per cent. of all peach varieties on the Murrumbidgee Irrigation Area and 41 per cent. of the three main varieties.

Planting Trends and Estimates.

The Murrumbidgee Irrigation Area is singularly fortunate, in that, as the result of an annual tree census, there is available a vast amount of accurate statistical data relating to the number, variety and age of trees.

It was analysis of these statistics which originally focussed attention on the crisis in the local peach industry, for in 1945 French* made an estimate of the likely future production for the three main canning varieties. These calculations were based on the assumption that existing trends with regard to average per acre production and gross rates of annual plantings and removals would continue. It was estimated that by 1955-56 the production of Golden Queen would approach 8,500 tons, Phillips 3,800 tons, and Pullars 4,160 tons. The importance of these estimates may be gauged by the fact that the average production for the total of all three varieties from 1940-41 to 1944-45 was 9,000 tons.

This estimate lacked certain desirable refinements, but it served to point out the danger existing in the planting policy being followed at that time.

Since that study, certain refinements have been introduced, and as a result a downward revision of the estimates of bearing acreage has been made; however, it will be seen later that the position must still be regarded as dangerous.

Put briefly, the procedure that has been adopted in the new estimates is that the

* FRENCH: Trends in Murrumbidgee Irrigation Areas Land Use, Tree Health and Production. 1939-45 (roneoed report).

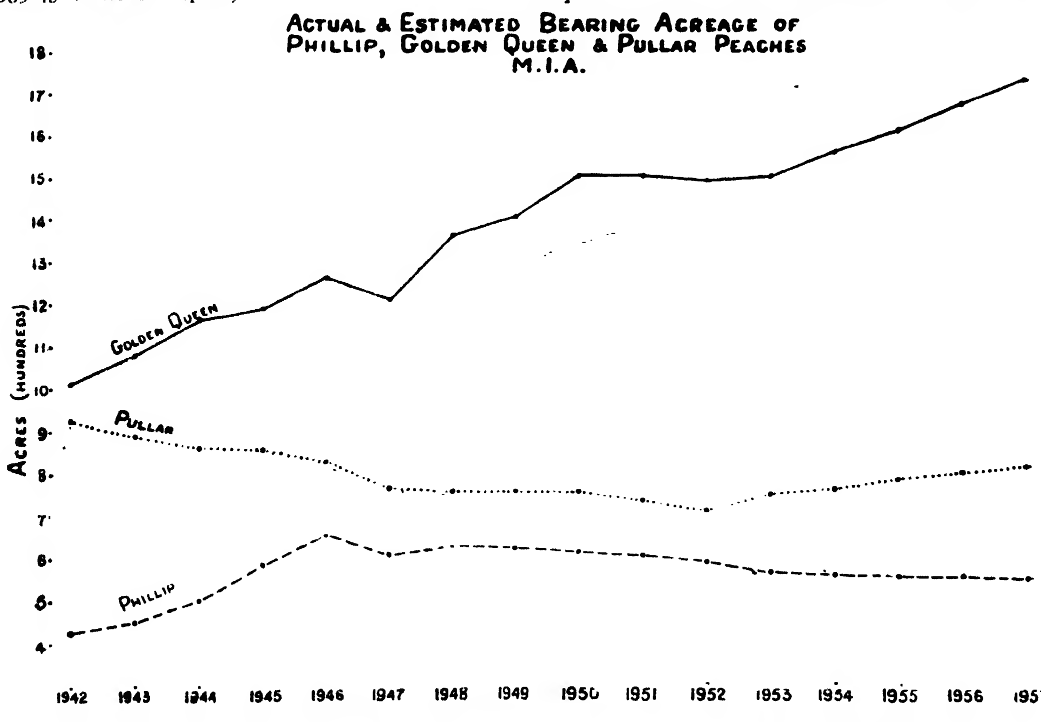


Fig. 1.—Graph showing Actual and Estimated Bearing Acreage of Phillip, Golden Queen and Pullar Peaches on Murrumbidgee Irrigation Area, 1942 to 1946.

plantings of each variety have been grouped in five-yearly age groups. The average annual acreage removed from 1939 to 1946 has been calculated for each, and making the estimate of future bearing acreage each age group has been depreciated at this calculated rate.

Furthermore, as the "accepted" age to bearing of peach trees on the Murrumbidgee Irrigation Area is six years, then it follows that for the season 1946-47 only trees older than those planted 1941-42 can be considered as bearing. Consequently in estimating the bearing acreage up to 1952-53 the annual plantings made 1941-42 to 1946-47 must be added progressively. It will be noted that the accuracy of the estimates of bearing acreage up to 1953-54 is only dependent on the correctness of the estimate of rates of removal. However, after 1953-54, the estimates of bearing acreage include also an estimate of annual plantings which has been taken as the average of plantings made in the five-year period 1942-43 to 1946-47.

The results of these calculations are illustrated in Fig. 1. (Note that the year 1942 on the graph refers to the season 1942-43, and other years are shown similarly.)

From this graph it will be seen that between 1942-43 and 1946-47, the bearing acreage of Golden Queen rose steadily from 1,021 acres to 1,270 acres. The estimated trend beyond that date shows a continued rise to 1950-51, then a flattening out to 1953-54, followed by a further rise. This flattening of the curve can be explained by the low rate of planting in the years 1944-45, 1945-46 and 1946-47, due to war-time shortage of young trees. (See Fig. 2.)

The graph for Pullars Cling shows a bearing area of 928 acres in 1942-43, only slightly less than that of Golden Queen at this date, but it is followed by a gradual decrease to 713 acres in 1952-53, after which date the line takes a slight upward turn.

In the case of Phillips Cling variety the bearing acreage shows a sharp increase between the years 1942-43 and 1946-47 from 427 acres to 657 acres. However, the reduced planting rate of previous years (see Fig. 2), due in a larger measure to loss of popularity amongst peach growers, will probably result in a gradual decline, as shown in the graph.

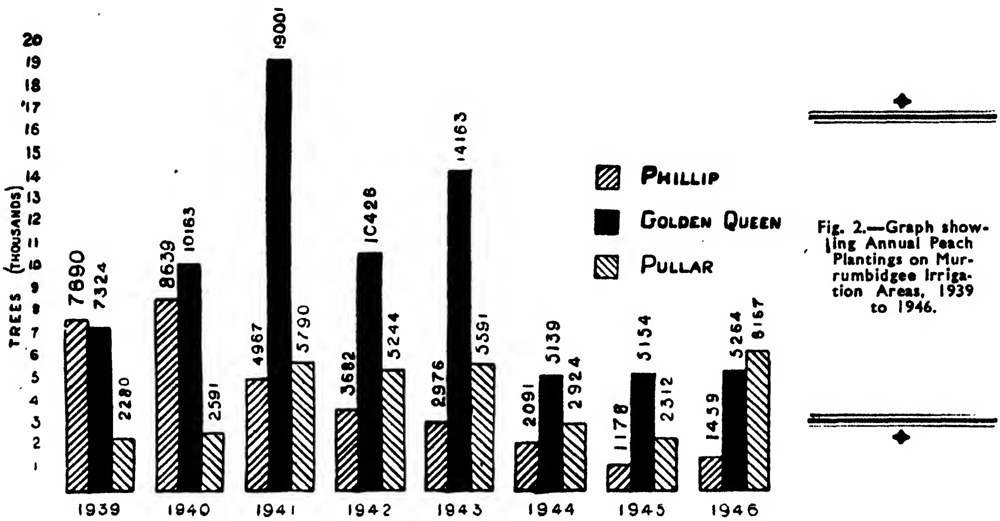


Fig. 2.—Graph showing Annual Peach Plantings on Murrumbidgee Irrigation Areas, 1939 to 1946.

Looking at Fig. 1 as a whole, the tendency for increasing concentration on Golden Queen is clearly demonstrated. In terms of tons of fruit produced, this trend would be even greater because there can be no doubt, although statistics are not available to prove it, that the average per acre production of Golden Queen would be considerably greater than that of Phillips Cling.

The annual planting rates of the three main varieties, as illustrated in Fig. 2, clearly indicate the preponderance which Golden Queen has assumed in the annual planting programme during recent years; the extreme instance is 1941-42 when Golden Queen plantings totalled 19,000 trees as compared

with only 5,000 trees of the Phillips and 5,800 trees of Pullars Cling.

The significance of these trends gains further weight if they are considered in relation to the percentage age group distributions illustrated in Fig. 3. In this regard it is worth noting that the "accepted" life of a peach tree on the Murrumbidgee Irrigation Area is twenty years.

In 1945-46, 78 per cent. of the Phillips Cling plantings were younger than ten years, production from these young plantings, because as stated previously, there is a considerable overlap on a district basis in the maturity dates of these two varieties.

There is little reliable data available regarding average per acre production, but there are reasons to suggest that a figure of 4 tons per bearing acre would be conservative. Using this figure, the new estimates of likely production for the year 1955-56 would be: Golden Queen, 6,500 tons; Phillips Cling,

PEACH AGE GROUP DISTRIBUTION AS PERCENTAGE OF TOTAL VARIETY PLANTINGS M.I.A. 1945-46

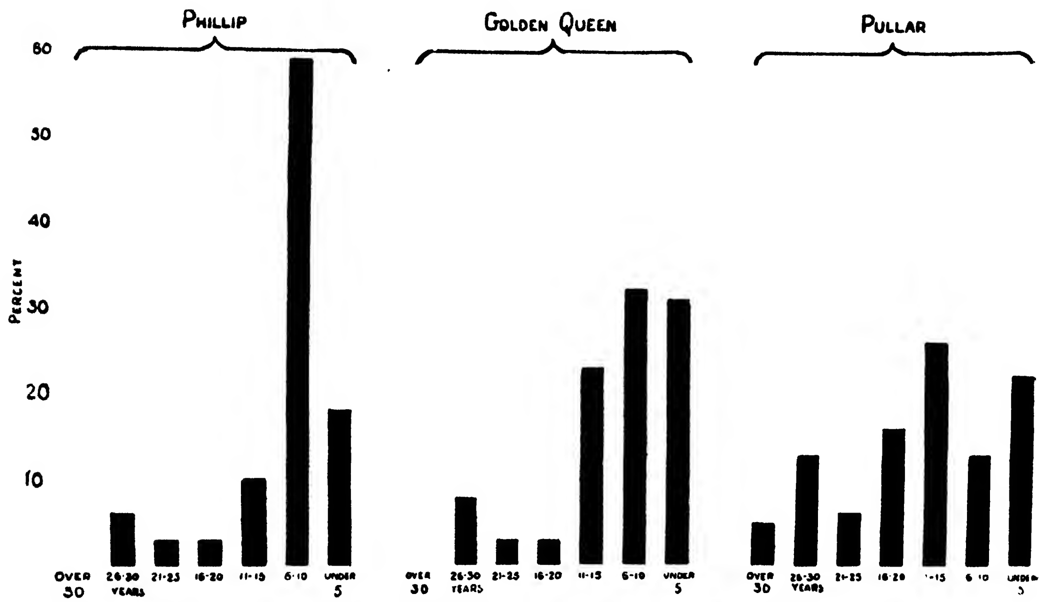


Fig. 3.—Graph showing Peach Age Group Distribution as Percentage of Total Variety Plantings, Murrumbidgee Irrigation Area, 1945–46.

63 per cent. of Golden Queen and 13 per cent. of Pullars Cling. On the other hand, only 9 per cent. of Phillips were older than twenty years and only 11 per cent. of Golden Queen, but 24 per cent. of Pullars Cling were older than this. It is obvious that the concentration of production on Golden Queen is made up of young plantings, and, therefore, is not likely to pass by quickly. Much the same can be said for the Phillips variety, but from the point of view of the length of the harvest season, the matter is not improved greatly by the possibility of increased 2,200 tons; and Pullars Cling, 3,100 tons. Comparing these figures with the average production of 9,000 tons of all varieties for the five-year period 1940-41 to 1944-45, it is evident that the position must still be regarded as serious. It must be kept in mind, too, that there is a distinct possibility that per acre yields may increase well beyond 4 tons as the large proportion of young trees settle down into full production.

(To be continued.)

POULTRY NOTES

ELECTRIC LIGHTING OF HOUSES FOR LAYING STOCK.

V. H. BRANN, Livestock Officer (Poultry).

MORE than twenty years ago Americans were using electric lighting in fowl houses to increase egg production. A few poultry farmers in New South Wales have been using lights with considerable success for many years, and fowl houses in which lights have been installed are now common in the "Hills" district and other centres around Sydney.

The longer "days" resulting from the use of artificial light level up the egg supply from flocks throughout the year; provided sound methods of husbandry are employed egg production is increased to a marked degree during the season of poor egg-laying, i.e., between March and July.

As the days grow shorter, the birds lay fewer eggs, and as the days lengthen the egg yield increases to a maximum number in the spring. The lights in the houses definitely prevent this effect of natural seasonal changes and the wide fluctuation of egg laying during the different seasons.

For a number of years there have been seasonal egg shortages. If more eggs were produced during the autumn, better returns would be obtained from flocks and more eggs would be available to consumers. The extensive use of electric lights in fowl houses may even create egg surpluses in the autumn, but such a situation is not likely to result for at least a number of years.

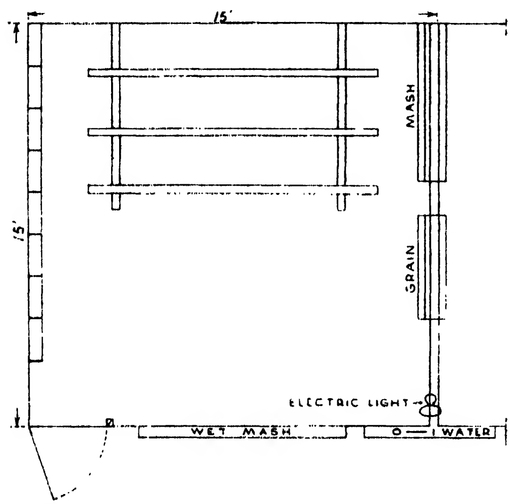
The explanation for this greatly increased autumn egg yield is that the artificial light enables the layers to eat more food. It is almost certain, too, that the lights act as a stimulant to the birds. A high food consumption is essentially correlated with good egg-laying. Apart from this, there is a strong tendency for laying flocks to progressively lose body weight. This must inevitably result in a collapse of laying unless the layers are able to eat and digest more food at a critical time—after a long laying season.

Installation of Lights.

The lights should be placed 6 feet from the floor of the houses, and where they will shine directly on the food hoppers. Reflectors are necessary to light up the whole of the roosting quarters and the entire floor space. A 60-watt globe is strong enough for 400 square feet of floor space.

The best and most widely adopted system of lighting houses is to turn on the lights early in the morning and keep them on until daylight, with automatic control by means of a time switch.

An ordinary alarm clock may be used as a switch, since time switches are expensive and difficult to obtain at present. The clock must be firmly attached to a shelf under the switch. One end of a piece of string is then attached to the alarm winding key, and the other end, looped, is placed over the lever of a tumbler switch.



Sketch of Ground Plan of Electrically Lit Poultry House.

Increased egg production can be obtained from all classes of layers. It is, however, doubtful if there is much wisdom in subjecting young pullets to this treatment, except autumn- or early winter-hatched pullets, which mostly moult heavily during the autumn. A "spot" of light on slow maturing and backward pullets will also hasten them to maturity.

The lights must be used with considerable discretion, if at all, on thrifty normal August- and September-hatched pullets. This treatment is too stimulating for these pullets, and may start a moult later in the winter in such a way as would offset any slight advantage gained earlier.

It is with old stock or second season hens that the lights have the highest value. These hens are, under ordinary conditions, sent to market late in the summer when values are low because of glutted markets. Healthy hens which moult during February or March will recommence laying within about five weeks after housing under lights, and the egg laying is commonly three times as much as even younger hens without the advantage of lighted houses. With these old hens the sole objective should be to obtain a quick and profitable egg yield; they should be disposed of as soon as they cease laying at any time later in the year. The best results are obtained from old hens when fourteen hours light is maintained.

Hens which have been kept previously in houses with yards or range are the most suitable for lights, because they respond quicker when transferred to intensive conditions.

The table below suggests the time to switch on lights for different classes of laying stock.

Cease Lighting by October.

Breeders are mainly selected from the late-moulting hens and the use of light as early as April would not be warranted. In any case a pause or spell is most desirable for breeding stock in order to obtain eggs of good quality and with high hatchability. The value of lights for breeding stock is still a debatable question. However, as hens are strongly recommended for breeding, more eggs would be laid by the birds under light during May to July, and therefore a maximum number of chickens could

Date.	Pullets.	1st Year Hens.	2nd Year Hens.	Breeding Stock.
1st–15th March	......	......	5.0 a.m.	......
1st April	5.30 a.m.	5.0 a.m.	4.30 a.m.	......
1st May	5.0 a.m.	4.30 a.m.	4.0 a.m.	4.0 a.m.
1st June	4.30 a.m.	4.0 a.m.	3.30 a.m.	4.0 a.m.
1st July	4.30 a.m.	4.0 a.m.	3.30 a.m.	4.0 a.m.
1st August	5.0 a.m.	4.30 a.m.	4.0 a.m.	4.30 a.m.
1st September	......	5.0 a.m.	4.30 a.m.	5.0 a.m.

be hatched from proved hens during the best part of the hatching season.

It will be noticed in the table that as the days lengthen, the time of switching on the lights becomes gradually later in the mornings, until, at the termination of the lighting season, the time almost coincides with daylight. If the lights were discontinued suddenly, there would be almost an immediate decline in egg laying, and most of the birds would start another false moult during August and September. This demonstrates the extraordinary effect of the lights on layers.

In the past some farmers have adopted the practice of cutting-off the lights as soon as egg prices fall early in the spring, and selling the whole flock at the high values offering at this time of the year. Such a practice is not justified if egg prices are satisfactory, and especially if there is a ready market for surplus eggs and foodstuffs are available. Maintenance of satisfactory production by rigid culling is the soundest and most scientific policy.

Suitability of Houses for Lighting.

Layers will respond to lights irrespective of the type of house in which they are accommodated. Some farmers have had lights installed in practically every house on the farm, including free range and semi-intensive houses. Taking all factors into consideration, the best results are obtained when the hens are transferred from houses with some range into intensive houses as they commence the seasonal moult. They benefit to a marked extent from the change to intensive houses. Furthermore, the cost of installing the lights to houses spaced over wide areas would be very high.

Opinions vary as to the best type of intensive house, but there is little doubt that the best egg laying is obtained when the layers are kept in small flocks of from fifty to seventy-five birds per unit.

The accompanying illustration shows a suitable type of intensive house 14 feet deep and divided into sections 15 feet long for fifty to sixty layers per section. The electric light globe is placed near the front of the house in each alternate partition, shining on both dry mash and grain self-feeders, which make feed available to the birds *ad lib.* The grille in the front of the house consists of six-gauge wires, 3 inches apart and 12 inches high; the water vessel and the wet mash trough may be seen in front of the house.

The wet mash, although not essential, increases food consumption, which is all important in obtaining quicker response to the effect of the lights and ensuring sustained laying from the flocks.

In each 3 lb. of wet mash may be mixed 3 lb. of green feed for each fifty layers daily.

View of the Front of a Poultry House equipped with Electric Lights.
Note grille in the front giving access to wet mash and water troughs.

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The amount of floor space allowed should be from 3 to 4 square feet per bird. The exact number that may be kept is governed by the standard of dryness and hygiene that can be maintained in the house; also by the length of time the birds are kept in the houses. If the floor is of earth and subject to dampness, 4 square feet per bird may be little enough. On the other hand dry floors with absorbent litter enable the droppings to dry out quickly and become pulverised, so that the manure itself actually becomes dry, absorbent litter. With such conditions, as little as 3 square feet per bird would be satisfactory, especially during a dry season.

The first sign of any offensive smell and of damp manure clogging under the perches is an indication that the house is either overcrowded or requires cleaning immediately.

The best materials for litter in order of preference are rice hulls and sawdust (50 per cent. of each); teased and spent tan bark; meadow hay or straw; and wood shavings. The litter should be placed on the floors to a depth of 3-4 inches. There is evidence that 2 lb. of hydrated lime per 100 square feet, scattered over the floors after cleaning will help to preserve the desired odourless, dry conditions in the houses.

Oats for Poultry Feeding.

THE Commerce Department has indicated that, in order to export the greatest possible amount of wheat, it will be necessary for stock feeders to use more oats this season.

There was a record crop of oats in this State during 1947-48, and reports by cereal authorities show that the quality of the grain is, on the whole, excellent.

Although poultry farmers are somewhat prejudiced against oats, there is ample evidence that it has no ill-effects on adult birds, or even young stock over three months old, when they become used to the grain.

During 1946 when there was an acute shortage of wheat, and a large quantity of oats was available, most poultry farmers used 50 to 60 per cent.; and in some cases even a larger proportion of oats. There was no apparent loss of production, where the grain was fed regularly, after the birds became accustomed to eating the oats. A few cases of digestive troubles were reported where oats were used exclusively for the grain portion of the ration and ground oats in the mash.

There appears no doubt that at least 50 per cent. of oats could be given in the afternoon feed without affecting egg production, or causing digestive disorders. The main consideration is to ensure that a regular supply is available in order to avoid frequent changes in feeding.

It may take as long as three weeks to induce the birds to eat the full quantity of oats essential to maintain production, and the best course during this time is to feed the oats before giving the quota of wheat. When the birds have become used to eating the oats, a mixture of wheat and oats may be fed at the one time.

American authorities claim that the extensive feeding of oats prevents feather picking and cannibalism and field observations here during 1946 appear to confirm this conclusion as the incidence of these vices was lower where a large percentage oats was fed regularly.

Summing up the position generally, there can be little objection to feeding up to 50 per cent. of oats in conjunction with wheat for the afternoon feed, or about 30 per cent. of grain and 20 per cent. of ground oats in the mash feed, provided that the cost is comparable with that of wheat on a weight basis, allowing for the waste in excess fibre.

Culling Fowls under Lights.

When healthy moulting hens have been under lights for three weeks, there should be a noticeable reddening of the combs and more activity among the birds. After this time birds which show no improved condition are culls, and are most conspicuous in a flock of "lighted" fowls, even to an inexperienced eye. These are mostly birds which suffer from digestive or ovarian disorders. Culling should commence one month after placing birds under lights, and this work should be carried out continuously throughout the year. Fairly heavy culling is necessary in average flocks; this is another reason why houses with lights should be reserved for the older stock.

Unthrifty birds with poor appetities go light, sluggish poor layers become very fat and a comparatively high proportion develop "waterbags" (abdominal dropsy). In average flocks of old hens, about 40 per cent. would be culled by skilled operators after the flocks have been under lights for six months.

When regular cullings are carried out, the majority of birds are sold when market values are firm, and these culls realise satisfactory prices and more than would have been the case had they been sold during the moult. This continual culling of hens under lights makes some sections of the houses available for more stock during the spring months.

If desired, cockerels could be raised in these houses to be sold during the late spring and early summer. Thus, another profitable sideline may be developed, and the houses

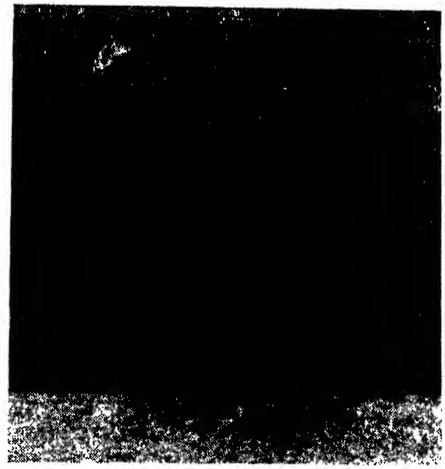
WINNERS IN THE 1947-48 HAWKESBURY AGRICULTURAL COLLEGE EGG-LAYING COMPETITION.

THE Forty-sixth Annual Egg-laying Competition held at Hawkesbury Agricultural College, Richmond, concluded on 15th March.

The Grand Championship—the A. A. Dunnicliff prize of £10 10s. for the group laying eggs of greatest market value—was won by Mr. R. Thoroughgood. His group of White Leghorns laid V,EVB *eggs with a market value of £11 11s. 7½d.*

The Golden Egg Trophy donated by the Metropolitan Meat Industry Commissioner and awarded for quality and production was won by Messrs. C. A. Clark and Son. This team of Australorps laid 1,485 eggs and scored 101.5 points—73 points for quality and 28.5 points for production.

A White Leghorn entered by Mr. R. Thoroughgood, winner of the Grand Championship.



One of Messrs. C. A. Clark and Sons Australorps This team was awarded the Golden Egg Trophy.

The bird illustrated also won the prize for highest individual score, having laid 285 eggs.

are never idle. Cockerel raising is suggested because the houses would be empty again in time to receive further hens at the end of the summer.

Effect on Egg Quality.

The system of housing fowls in small flocks with dry conditions reduces the number of dirty eggs to a minimum.

Some contend that eggs laid by lighted fowls are not of high quality. In actual fact, lights have no direct effect on egg quality. Sustained egg-laying and first-class egg quality are two highly desired characters which, unfortunately are hard to combine. As most fowls kept under lights are old stock, it cannot be expected that the quality of eggs laid will compare favourably with eggs laid by pullets, but as the eggs laid during the autumn are solely for local consumption, any slight deterioration in shell texture or lack of density of the albumen in the eggs, hardly needs to be considered.

Breeds for Lighted Houses.

All breeds are equally susceptible to the effects of lights in the houses. White Leghorn is easily the most popular breed because of the large numbers kept on the majority of commercial farms. The tendency for the Leghorn to neck moult and cease laying during the changeable weather conditions of the autumn is avoided when kept in lighted houses. White Leghorn-Australorp crossbred hens are also satisfactory.

The extensive use of electrically-lit houses would enable farmers to keep all good hens for the best part of another year and obviate the necessity of selling large numbers of stock in the autumn as an alternative to carrying them over a long period with little or no profit. This aspect is important because the rush of moulting hens on to the poultry market from January to April, and the usual decline in hen values, would not occur.

Thus this system would automatically create an effective system of poultry marketing stabilisation.

Unless the farmer was desirous of continually expanding his farm, there would not be any need to raise the usual large proportion of pullets for flock maintenance each year, so that autumn production can be kept at a level to show some profit over feeding costs.

The expectation of egg-laying from hens under lights can be estimated with a high degree of accuracy where sound methods of poultry husbandry are employed. The same cannot be said of August- or September-hatched pullets, because of the hazards brought about by coryza, worm infestation, leucosis and other diseases of the more susceptible young stock.

The Economic Aspects.

Few farmers who have used lights on layers will not agree that greatly enhanced returns have been obtained.

The wider adoption of this system may, in years to come, saturate the demand and cause a levelling up of egg prices throughout the whole year. This will, however, result in a greatly increased egg consumption. Should this contention be proved correct, most farmers will be virtually forced to adopt the system or otherwise replace most of the flocks with young stock each year to obtain satisfactory returns.

The use of lights in fowl houses is almost universal in large egg exporting countries such as Canada and Denmark. The main object there is to create large winter surpluses for export which may, in time, adversely affect the prices that this country can obtain for eggs exported to Britain.

Whatever may be done to improve egg quality, it would be difficult to produce spring eggs that would, on arrival, compare favourably with the winter eggs produced in these countries. This may be a major problem for Australian marketing authorities, but fortunately such an eventuality cannot occur for at least five years.

CLOTHS should never be used for washing dairy utensils. A clean scrubbing brush should be employed, the brush being allowed to dry in the sun when not in use.

Utensils should never be dried with a cloth—the heat derived from the boiling water or steam used in cleansing will cause them to dry rapidly. Dairy utensils should also be protected against dust infection.—DIVISION OF DAIRYING.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingba State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa (Jerseys) ...	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Hawkesbury Agricultural College, Richmond (Jerseys)...	106
Hicks Bros., "Meryla," Culcairn (A.I.S.)	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
McEachern, H., Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, "Jerseymead," Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys) ...	49
New England University College, Armidale (Jerseys) ...	25
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	35
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco (Jerseys)	76
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S.)	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas, R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R. "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale ...	62
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	69
Salway, A. E., "Coolagalite," Cobargo	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

TRAINING for the TRAIN

★

Thousands of school children regularly travel by train. The conduct of many of them reflects credit upon those responsible for their training. Others, unfortunately, are at times guilty of behaviour that leaves very much to be desired.

Some of these children attempt to interfere with railway equipment and perform pranks and reckless acts that endanger themselves, other passengers, and railway employees. Quite recently a regrettable accident occurred when the driver of an electric train suffered severe head injuries resulting from a stone thrown by a school boy in a passing train.

Railwaymen have been requested to keep a watchful eye on these young travellers in order to assist them to form habits that will promote safety on railway premises. Constant training, however, both at home and at school, is also necessary to develop these youngsters into safety-minded train travellers. As a consequence, co-operation on the part of parents and teachers is earnestly sought by the Railway Administration.

S. R. NICHOLAS,
Secretary for Railways.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.) ...	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	33	23/6/48
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/4/49
Cowra Experiment Farm (Ayrshires) ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	3/3/48
Fairbairn, C. P., Woomargama (Shorthorns)	173	27/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49	17/12/48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L. "Pine Park," Mumbi Beef Shorthorns)	74	2/2/49
Limond Bros., Morisset (Ayrshires) ...	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys) ...	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys)	94	27/10/48
Riverina Welfare Farm, Yanco (Jerseys) ...	91	14/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys) ...	58	3/3/48
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords)	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)...	119	20/4/48
Yanco Agricultural High School, Yanco (Jerseys)	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle ...	49	14/4/48
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brookfield Afforestation Camp, Mannus ...	209	12/8/48
Burns, R., "Wilga Glen," Coonamble ...	20	24/12/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell	32	11/8/48
Coventry Home, Armidale	11	29/9/48
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Forster, N. L., and Sons, "Abington," Armidale	62	24/5/48
Frizelle, W. J., Rosenstein Dairy, Inverell ...	111	9/9/48
Genge, G. L., Euston, Armidale	36	22/9/48
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood ...	22	20/5/48
Harcombe, F. C., Hillcrest Farm Gum Flat Road, Inverell	60	30/6/47
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	34	22/9/48
Johnson, A., "Rosedale," Grafton Road, Armidale	34	22/9/48
Kenmore Mental Hospital	77	7/7/48
Koyong School, Moss Vale	2	15/5/48
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	7	12/12/48
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department,, Rydalmere Mental Hospital	40	20/11/48
McMillan, N., Duval Road, Armidale ...	30	29/9/48
MacNamara, B., "Mount View," Cessnock...	58	16/5/48
Marist Bros. College, Campbelltown ...	82	23/1/49
Mason, A., Killarney, Armidale	33	30/9/48
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
O'Brien, O., "Mount View," Inverell ...	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	12	29/12/48
St. John's Hostel, Armidale	6	24/6/49
St. Michael's Orphanage, Baulkham Hills ...	43	5/6/48
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boy's Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	53	10/2/48
Tanner, F. S., Dural Rd., Armidale... ...	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale ...	33	30/9/48
Tombs, P. C., Kellys Plains, Armidale ...	49	29/9/48
Tombs, R., Harlwood, Armidale	40	22/9/48
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48
Von Frankenberg, F. E., "Spring Hills," Camden	68	12/12/48

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.	Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*			Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Wallaga Lake Aboriginal Station	19	29/4/47	Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
Waters, A., Marsh Street, Armidale	2	13/10/48	William Thompson, Masonic School, Baulkham Hills	52	10/6/48
Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48	Youth Welfare Association of Australia ...	171	14/4/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47			

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Murrumbidgee Irrigation Area Is No Longer a Quarantine Area for Pleuro-pneumonia.

CANCELLATION of the notification imposing quarantine restrictions on the entry of cattle to the Murrumbidgee Irrigation Area has been approved by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.)

Commenting on this change, Mr. Graham said that a severe outbreak of pleuro-pneumonia of cattle in the early days of the Area, when a number of dairy farms was being established, had led to the original decision to declare the Irrigation Areas a quarantine into which cattle could only be introduced under special conditions.

Since then, the number of cattle in the Area had declined considerably, and was now too small to cause any serious difficulty in the event of any outbreak of disease.

It had been decided therefore that no good purpose would be served by continuing the restrictions.

Cattle Tick—Release of the Fine Flower Area.

THE Minister for Agriculture, Hon. E. H. Graham, M.L.A., has announced the release from quarantine restrictions of the Fine Flower Tick Quarantine Area.

Commenting on this move, the Minister stated that this area had been placed in quarantine on account of the discovery of tick-infested cattle which had gained entrance to the area following breakdown of the tick quarantine fences during the flood and cyclone on 12th-13th June, 1945.

Mr. Graham said that since then the cattle in the area had undergone a thorough dipping and intensive inspectional programme and no evidence whatever of cattle tick had been detected. It had therefore been decided to release the area from all quarantine restrictions.

The area comprises some 250 square miles of country to the north-west of Grafton and contains 25,000 head of cattle.

The Agricultural Gazette
OF NEW SOUTH WALES.

MAY, 1948.

2A CLUBS.

Agriculture and Aviation.

A MOVE to cement more firmly the common interests of aviation and agriculture by the founding of 2A Clubs was launched last month at a meeting in Sydney attended by representatives of the R.A.A.F., civil aviation, commercial airways companies, rural industries, the Department of Agriculture, press and radio.

Originator of the scheme, Mr. D. M. Shand, a farmer from Armidale, has already constructed an airstrip on his property to accommodate planes which may be called in for aerial dusting or spraying of his crops.

Addressing the Sydney meeting, Mr. Shand quoted this as only one of the many advantages which would accrue to producers from the construction of airstrips on their properties.

It was not an experimental or pioneering venture, nor was the idea new, except perhaps to Australia, which was years behind other countries in making full use of the aeroplane to assist primary production. The alliance of aviation and agriculture had a two-way advantage—agriculture would benefit, and so would aviation.

Benefits to the man on the land included the protection of his crops by aerial dusting and spraying, protection of his pastures, and consequently his stock, from such hazards as grasshopper plagues, quick transport of perishable products to market, spotting of bushfire outbreaks, and making available city amenities (medical and other services) even to the most isolated farm families.

Farm airstrips such as visualised by this scheme would involve little expenditure. Often merely the removal of a few stumps or dead trees, or perhaps a heap of stones was required, or alteration of a line of fence. It was suggested that in many cases the strip could be used to advantage for the growing of grass seed for which there was a payable export market.

With aviation authorities and the Department of Agriculture behind the scheme, the promised assistance to producers in laying out and utilising the strip areas to best commercial advantage could be confidently accepted.

While some of the advantages promised by this scheme might seem somewhat out of reach at present, that was solely because of lack of airstrips. Given sufficient strips, then planes, men to fly them, and capital to develop the services outlined could readily be found.

With the country adequately covered by farm airstrips, development in all spheres

of aviation would be speeded up largely because of added safety afforded. That would be the benefit to aviation. A further advantage to the nation would result through having numerous emergency landing fields in times of threatened invasion—a threat which was very real not so long back.

At the Sydney meeting it was unanimously resolved to push ahead with the formation of 2A Clubs. To further the proposal a representative committee was formed, and one of its first tasks will be to consider competitions for the best laid-out farm airstrips.

Artificial Insemination Bill.

THE importance of artificial insemination to the future breeding of livestock in New South Wales, and of the need for control measures—both to ensure the success of the process as a breeding technique and to protect stockowners against unscrupulous and incompetent operators—were stressed by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) in his second reading speech of the Stock (Artificial Insemination) Bill.

"Artificial insemination is not extensively practised in Australia at present," said the Minister, "but my Department has established an insemination centre at Glenfield Veterinary Research Station, which is giving a service to local cattle and is providing opportunities for study of the technique.

"If Australia is to take her full part in the stock breeding world, we must keep abreast of other countries and follow along the most highly scientific lines of breeding, so that our production will be equal to those countries. Opportunities in the field of artificial insemination in New South Wales are so good that early establishment of centres on a commercial basis can be expected."

Stressing the highly technical aspects of the process, Mr. Graham pointed out that special equipment had to be used and skilled persons employed in collection of semen. If fertility of semen was to be preserved, he continued, it must be scientifically stored and packed before distribution. The operation of artificial insemination itself was a job only for persons of training and experience. With commercial development of the process, some measure of control would be necessary if stockowners were to be protected against unscrupulous and incompetent operators. The Bill before the House had been prepared for that purpose, and it provided for licensing of premises for use in the collection, storage and packing of semen for sale.

Regulations could be made with respect to the conduct and equipment of licensed premises, with particular regard to the manner in which semen was to be collected, stored and packed for sale, and also with respect to the conditions under which stock could be used on licensed premises for the collection of semen for sale.

A power was provided for in the Bill for regulations to be made governing the sale, exportation and importation of semen. There was also a power in the Bill, by Proclamation, to prohibit importation of semen from any State or place outside New South Wales where disease existed or was believed to exist.

The performance of the actual operation of artificial insemination was restricted in the Bill to registered veterinary surgeons and to persons possessing qualifications which might be prescribed by Regulation. On this point, Mr. Graham stated that he had in mind to arrange for schools to be held at Glenfield Veterinary Research Station and at other suitable centres, for the training of stockowners and their employees in the process.

Powers of entry and inspection had been conferred on inspectors under the Stock Diseases Act, 1923-1934, and on veterinary officers of the Department of Agriculture, said the Minister. In addition, veterinary officers might, under instructions from the Chief Veterinary Surgeon of the Department, subject stock on licensed premises to tests for disease and to tests for determining their eligibility for use in the collection of semen.

Mr. Graham emphasised that the restrictions placed by the Bill had no application where semen was collected by a stockowner and used by him in the insemination of his own stock.

"The Home Vegetable Garden."—Valuable New Booklet Now Available.

THERE are three essentials to home vegetable growing—plenty of sunshine, good soil and a permanent water supply—and remember that a small garden well cared for is better than a big one neglected.

This statement is made as the opening paragraph of a new booklet, "The Home Vegetable Garden," compiled by officers of the Department of Agriculture and published on behalf of home and garden lovers by the Rural Bank of New South Wales.

All possible aspects of home vegetable growing, including soil preparation, use of organic matter and fertilisers, seedling raising, cultivation, seed production, harvesting, disease and insect control, home preservation and storage, are covered in this valuable publication, which is profusely illustrated and is available from the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney, at the price of 2s. post free.

AGRICULTURAL BUREAU . . . DISCUSSION . . .

PROBLEMS OF THE WHEATGROWER.

FOLLOWING is a report of a discussion on "Problems of the Wheatgrower," by Dr. Stephen L. Macindoe, Principal Agronomist (Research), Department of Agriculture, Mr. George Nicholson, Special Agronomist (Cereals), Department of Agriculture, and Mr. Eric Bond, Director, Bread Research Institute of New South Wales.

The discussion took place at the recent Macquarie Divisional Conference of the Agricultural Bureau.

Dr. Macindoe: Well, Mr. Nicholson, you have had many years of experience in this district and have recently seen a good deal of wheat growing in other parts of the State. What do you feel are the main farming problems facing the wheatgrower to-day?

Mr. Nicholson: I place soil fertility maintenance first. This involves consideration of crop rotation, ley farming and of the related practice of stubble mulching. Secondly the selection of suitable varieties is important because of its influence on yield. Resistance of varieties to disease and cold damage also affects yields. Thirdly, we must not forget the question of the milling and baking quality of our grain because the interests of the consumer must be considered. Baking quality is closely bound up with the question of wheat grading and also with the influence of weather damage on the grain.

Mr. Bond: Those aspects you have just mentioned, Mr. Nicholson, seem to cover a very wide field. I would suggest that you deal mainly with the soil fertility aspects; Dr. Macindoe with selecting the varieties to grow; and myself with milling, baking and grading, aspects with which I am closely associated.

Soil Fertility Maintenance.

M: Well, to deal first with this question of soil fertility.

We have just completed the biggest wheat harvest on record, equal to about two average crops. From what one hears of the activities of the British Food Mission now in Australia it looks as though there is going to be an almost unlimited demand for most of Australia's primary products for a number of years. This might seem a very rosy picture, but isn't there a danger of this demand to produce more and still more resulting in a depletion of soil fertility and the undermining of our soil resources?

N: I agree with you, Doctor, that while a high rate of production is desirable, we cannot overlook the fact that soil fertility will play an important part in the future development of a stable agriculture. To meet world requirements without following a soil-exploitive farming programme it will be necessary for attention to be paid to using suitable crop rotations designed to maintain soil fertility.

B: Of course, you are mainly concerned with the influence of soil fertility on yield. That is important, but I represent the interests of the consumer and have to go a stage further.

It is my job to help the consumer get a better loaf of bread. When I hear farmers speaking of bumper crops and record yields I must realise that this usually results in a marked drop in baking quality. Heavy crops must also lead to a depletion of soil fertility, at least unless measures are taken to adopt a system of farming which maintains or builds up soil fertility.

N: Certainly if the farmer is going to grow wheat of high baking quality the maintenance of soil fertility also is important. If the farmer is to produce wheats of high

quality they must contain an adequate amount of protein. Protein is largely built up from nitrogen, so that, other things being equal, a soil rich in organic matter and nitrogen will produce wheat of better baking quality. This is even more marked with varieties of superior baking quality.

B: We agree that both improved yields and better baking quality will result from an improvement in soil fertility. There is a good deal of talk these days about poor methods of farming, the need for crop rotations and for soil conservation. What is the Department doing about it; what are farmers doing about it?

N: There are a number of reasons why farmers follow soil exploitive practices. Probably the most important of these are economic considerations. However, I can assure you that many farmers are alarmed at the lowering of soil fertility, brought about largely by over-cropping. They are altering their farming methods to combat this problem. On the other hand, as most wheat to-day is purchased on an f.a.q. basis, the farmer is mainly concerned about yield. Fortunately, however, a build up in soil fertility can be expected to improve both yields and baking quality.

Of course, in the earlier days of wheat growing in this district, it was found that constant cropping for a number of years gave excellent returns—the soil was in excellent physical condition and there was little or no weed problem. We must try to get back to that stage. As the land became older there was a drop in fertility and long fallow became widely used, partly as a means of combating weed growth and preparing a good seed bed. This temporarily boosted yields, but the erosion problem was intensified by bare fallow. While alternate cropping and bare fallow may increase yields for a few years, it is definitely an exploitive practice; unless some form of rotation is adopted yields will assuredly decline. Wheat quality due to soil exploitation has declined in this district.

B: That is definitely true both in this and many other districts.

Pasture as a Rotation.

M: Yes, but the recommending of suitable rotations for our wheat belt conditions is not always easy. Oats for grazing are useful in the rotation, but it is doubtful whether they add much to soil fertility. Surely there are better methods of restoring the physical and chemical condition of the soils in the central-west. What about the sowing of pastures to build fertility?

N: Yes, Doctor, to some extent we can rely on volunteer pasture growth of the right species. By that I mean trefoils and clovers. In the Coonabarabran district, subterranean clover is by no means as successful as it is in some other parts of the State, but ball clover, barrel clover and burr trefoil will grow readily on well managed land. Unfortunately, on low fertility soils which have become exhausted by over-cropping and eaten out by rabbits there is very little natural regeneration of legumes. On such soils it is necessary to re-introduce the clovers, to spell the country during re-seeding and, as far as possible, arrange ploughing dates so that the clovers and trefoils will have seeded prior to ploughing. Actually after several years of wheat cropping there is nothing better than a semi-permanent pasture consisting of a mixture of lucerne, clovers and Wimmera ryegrass.

B: I should be interested to know what influence such a pasture mixture is likely to have on the physical as well as on the chemical condition of the soil.

N: Legumes, such as lucerne and clovers, would have the ability to make use of the nitrogen of the air in building up soil nitrogen on which the protein content and baking quality of the wheat grain so largely depends. But, in addition to the chemical changes in the soil, I believe that improvement in the physical condition of the soil is at least as important. Recent investigations carried out at the Waite Institute in South Australia confirmed what most of us have realised for many years—that a continual wheat-fallow cropping definitely leads to a deterioration in the physical condition of the soil.

There is nothing better than a period, preferably of several years, of pasture to improve the physical condition of the soil.

B: What about superphosphate in this district?

N: You will be interested to know that the heavy volcanic soils in this district do not appear to need superphosphate but on red loams the response is often gratifying. Actually, we frequently find that fertilisers

GL189-24

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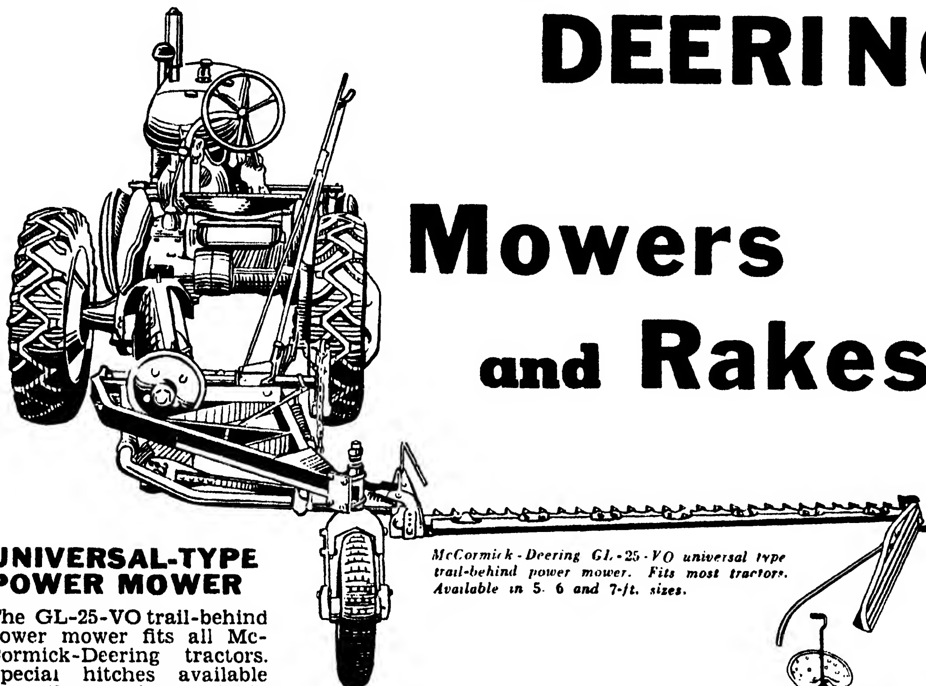

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McCormick-Deering GL-25-VO universal type trail-behind power mower. Fits most tractors. Available in 5, 6 and 7-ft. sizes.

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The GL-25-VO trail-behind power mower fits all McCormick-Deering tractors. Special hitches available for other makes. Highly efficient, quiet, smooth drive with V-belt and safety slip clutch. Also equipped with safety spring trip for automatic release of cutter bar when obstructions are met.

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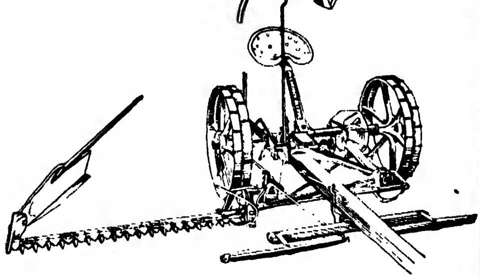
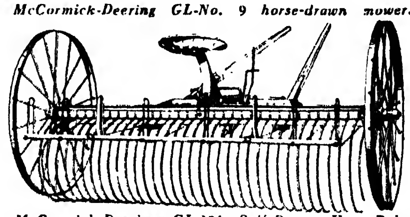
Features of GL-No. 9 horse-drawn mowers include: Zerol-type bevel gear and pinion; High-grade steel gears; Entire transmission operates in oil, enclosed in dust-tight leakproof gear case; Ball-bearing automatic pitman; Latchless levers. . . . 4½, 5 and 6 ft. sizes.

SELF-DUMP HAY RAKES

GL-104 Self-Dump Hay Rake is equipped with strong I-beam teeth and quick-acting dumping mechanism. Sturdy smooth-running steel wheels with roller bearings and replaceable sleeves. Conveniently placed lever makes cocking easy. 8 and 9-ft. sizes.



McCormick-Deering GL-No. 9 horse-drawn mower.



McCormick-Deering GL-104 Self-Dump Hay Rake.

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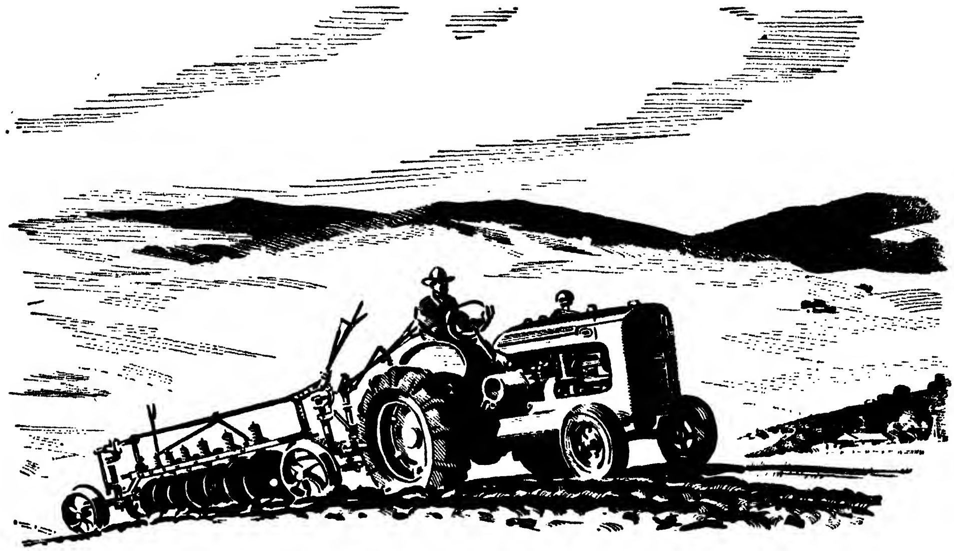

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When Cross kerosine goes to work for you it does so in a money-making way. Not a drop is wasted and more power is delivered, more economically, than you've ever thought possible. Cross vaporises completely. Tractors run well on it and, because of its much higher quality, they need less attention. Every overhaul means your tractor is off the job for so many hours or days. Cross means less overhauls—more working hours. Use Cross Power Kerosine and Shell Motor Oil in your tractor. You'll find it pays. Call, write or telephone your local Shell Depot or Agent for your Supplies.

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show a poor response on exhausted soils. Recent American literature has shown that greater responses to superphosphate are obtained when the organic matter in the soil is adequate. It is probable that similar results would be obtained here.

M: That is only one of the things with which we are experimenting on our wheat belt Experiment Farms. Some very interesting tests are also being started to determine the influence on soil fertility of various types of pastures and also the influence on fertility of pastures laid down for different lengths of time.

B: One reads a good deal these days about ley farming. Does the sowing of pastures in rotation with wheat constitute ley farming as far as this district is concerned?

N: Yes, a period of pasture, perhaps four or six years, followed by three or four crops of wheat in succession can be said to constitute a system of ley farming in this area. As I mentioned earlier special methods may be adopted to build up a pasture of naturally occurring species, or a pasture may be sown with a special pasture mixture.

M: What about the use of cover crops in establishing pastures?

N: The use of a cover crop of wheat or oats is undoubtedly more economical and is frequently successful, provided the soil is in good physical condition. Personally, I hold the view that failure to obtain the establishment of a pasture with a cover crop in a season of average rainfall is due primarily to depletion of soil fertility. In the past it was a common practice for large landholders to make available a pasture paddock to wheat share-farmers. Such paddocks were cropped for three or four years, and in the final cropping year lucerne was sown with the wheat. Very few failures occurred, because fertility and physical condition were good. It is a different story attempting to establish lucerne on land incapable of growing even a decent cereal crop. Personally, I should recommend a pasture mixture of 1½ lb. to 2 lb. of lucerne, 1 lb. of Wimmera rye, and ¼ lb. to ½ lb. of barrel trefoil. Cost per acre of this seed is only 6s. to 7s. and there are good prospects of harvesting a seven to nine bag wheat crop, in addition to establishing the pasture at a very low cost.

B: In view of the cheapness of this method of pasture establishment it is surprising that a larger number of paddocks thrown out of wheat production are not carrying the soil building species which you recommend. Unfortunately, many paddocks temporarily out of wheat production seem to grow only burrs, saffron thistles and other useless species. Are farmers in this district actually adopting the practice you recommend?

N: Yes, what I have recommended is already an established practice among a number of the more progressive farmers. However, I should like to see much more general use made of this practice.

Stubble Mulch Farming.

M: Just before leaving this important matter of soil management, there has been a good deal of talk over the last two or three years about stubble mulch farming. Could you tell us in a nut-shell what is meant by stubble mulch farming as compared with ley farming. The subject of "ploughless farming" would have little interest in a relatively dry district such as this.

N: I am very pleased you raised that point. So far we have not made much progress with stubble mulch farming, largely because of the lack of suitable stubble tillage implements. Stubble mulch farming implies that the bulk of the straw from the previous crop is retained on the surface, in order to provide a protective covering against washing and blowing. Some farmers I have met have thought that stubble mulch farming means ploughing in the stubble. That is not the case. Most of us will agree that the burning of the stubble should be avoided as far as is practicable. While the ploughing under of stubble may be quite useful for a long fallow, there are certain disadvantages in planting a crop shortly after a stubble has been ploughed under. Frequently this has a depressing effect on yield, due it is now known to the fact that a considerable amount of soil nitrates may be tied up during the decomposition of the straw. By keeping the straw on the surface it is argued that soil moisture is increased, soil structure is improved and erosion controlled.

M: It is unfortunate that we in New South Wales have as yet no actual experimental data on the influence of the stubble

mulch farming on yield. Most of our information is based on American experience. It is known that over there something over a million acres is being trash farmed, as they call it, in the States. Some preliminary trials have been laid down on our Experiment Farms but so far the absence locally of suitable machinery for cultivating, and particularly for sowing under a straw mulch, has prevented our getting very far. When we know more about this system of farming we may be able to hit harder against the practice of stubble burning.

N: Even at the present time I am prepared to state that stubble burning is generally unnecessary. I can think of a specific instance in this district where one small landholder with a cultivation area of something less than 500 acres has during the past ten years refrained from burning stubble. During that period he has maintained an average yield of ten bags per acre. He has developed a balanced system of crop rotation and stocking. His cash return per acre is surprising, and I doubt if it can be excelled by any other farmer in this district.

I would just like to add this, that although we have no specially constructed stubble mulch machinery available yet, it is possible to use disc implements in such a way that the straw is largely held in the top 1 or 2 inches of soil. Admittedly, this is not true stubble mulch farming, but I believe it is better in most instances than the deep ploughing-under of the straw. By working with a disc implement to a depth of, say, only 2 inches, the bulk of the straw is retained in the surface mulch. This method of cultivation has been particularly useful in the sowing of oats, primarily to provide winter feed for stock.

Suitability of Varieties.

B: Mr. Nicholson, you have stressed the importance of crop rotations and the value of a period of pasture in the maintenance of soil fertility and soil condition on wheat farms.

In addition to the soil, the use of the right variety of wheat is very important. It is important, too, because baking quality depends on variety as well as on soil and climate. Apart from the inherent gluten quality of a variety, resistance to disease such as rust may exercise a considerable influence on the value of the grain to the miller, the baker, and, finally, the housewife. Farmers, millers and bakers are particularly interested in the five new varieties, Gabo, Yalta, Kendee, Charter and Celebration.

N: Dr. Macindoe, you have been associated with the production of some of these wheats and farmers are here to get information. Perhaps you could indicate some of the chief characters and points of interest of these varieties.

M: Of course, the character common to all these varieties is their high degree of resistance to stem rust. As you know, Gabo and Kendee were bred by the University of Sydney and the other three by the Department. As far as we are concerned our main interest is to get improved varieties to the farmer, irrespective of how or where they were bred. Eventually it is the farmer who will decide what variety it pays him best to grow.

B: The wide growing of Eureka, particularly in the north-west, was of considerable value in helping millers to maintain satisfactory baking quality in their flour. I understand that this variety, which was for several years resistant to stem rust, has now become susceptible, and that its popularity is rapidly dwindling in view of the heavy rust damage in crops of Eureka during the past season.

M: Yes, it is true that our experience with Eureka was very disappointing. The break-down of Eureka's resistance was due, we know now, to the advent of a new type of rust. I do not feel, however, that we need to be unduly pessimistic about the stem rust resistance of the five new varieties breaking down. Of course, a breakdown is always possible. I feel rather that we have been particularly unfortunate in our Eureka experience. In many other parts of the world high rust resistance has been maintained for many years. For instance, in America, where there are many more races of stem rust than in Australia, the new resistant variety Thatcher is planted on 17½ million acres. Thatcher itself, or the resistant parent from which it was derived, has maintained its high resistance to stem rust over a period of about forty years. This and other evidence at least suggests that the resistance of certain varieties may be maintained for very many years, and perhaps even indefinitely.

B: Have you any idea of the damage due to stem rust in lowered yield during the past season?

M: Yes, a fairly accurate survey has been made by the Biologist of the Department. It is considered that the loss due to reduction in yield from stem rust amounted to £3,500,000 in New South Wales. I would suggest that the damage might quite easily have amounted to £8,000,000 or £10,000,000 if temperatures in the southern districts had been slightly higher. When one thinks of the amount of damage done from a single rust epidemic the small amount spent on research is surely only a drop in the bucket. It may interest you to know that a rough calculation suggests that the total amount spent on wheat research in New South Wales does not amount to one-tenth of 1 per cent. of the value of the wheat crop.

(To be concluded.)

Short Refresher Courses for Ex-servicemen.

THERE are still vacancies for trainees who desire to take one of the refresher courses for ex-servicemen commencing at Yanco Experiment Farm on the following dates:—

No. 6 .... 9th August, 1948.
No. 7 .... 11th October, 1948.

Earlier courses are now fully booked.

The course is of two months duration and trainees are accommodated at the Experiment Farm.

The syllabus covers the principles of farm management and includes such subjects as elementary veterinary science, agricultural economics, crops and pastures, pasture improvement, etc. Specialist classes are arranged for sheep and wool, dairy and pig, horticulture and poultry.

Full C.R.T.S. rates of pay are paid and return tickets from the trainees home to the Farm are issued.

Ex-servicemen who have been discharged *less than one year* should apply to C.R.T.S., Grace Building, Sydney.

Those who have been discharged *for a longer period*, but who hold a Qualification Certificate under W.S.L.S., are eligible, but should apply to—

The Deputy Co-ordinator, Rural Training,
Department of Agriculture,
G.P.O., Box 36A,
Sydney.

Dairy Science Schools, 1948.

DAIRY science schools for those desiring to qualify for certificates for milk and cream testing and cream grading are to be held as usual in country centres during the coming winter months. The schools, however, will be held only at those places where there is a guaranteed minimum attendance of ten candidates for that particular school.

Applications for attendance, accompanied by a fee of 10s. 6s., should be addressed to the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney.

Before a cream grading or cream testing certificate will be issued, evidence of twelve months' experience in a dairy produce factory (butter) will be required. Before a certificate covering milk testing will be issued, evidence will be required to satisfy the Chief of the Division of Dairying that the candidate has had sufficient practical experience.

The closing date for the receipt of applications is 31st May, and as soon as possible after that date intending candidates will be advised by the Department as to the centre at which they will be examined.—DAIRYING DIVISION.

District Livestock Officers to be Stationed at Tamworth.

MR. J. H. GULLIFORD, Livestock Officer (Poultry), and Mr. C. R. Tandy, Livestock Officer (Pigs), have been appointed as district officers to the Tamworth area.

Making this announcement the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that Mr. Gulliford would take up duty at Tamworth in May, and Mr. Tandy would take up duty in July—this temporary delay being due to a necessary rearrangement of the Piggery Staff in Head Office.

Approved Vegetable Seed—May, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—continued.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, "Sherwood Farm," Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Hunter River Brown—R. C. Morandini, Box 74, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Coonamble	May 4, 5
Trangie	May 4, 5
Warren	May 11, 12
Walgett	May 13, 14
Gilgandra (A. Christie)	May 18, 19
Nyngan	May 19, 20
Sydney Sheep Show	June 2, 3, 4, 5
Cootamundra Sheep Show	June 15, 16
Condobolin (G. L. Maxwell)	August 10, 11
Trundle (W. A. Long)	August 17, 18
Weethalle	August 18
Lake Cargelligo	August 20, 21
Peak Hill (H. J. Dawson)	August 24, 25
Wagga	August 24, 25, 26
Grenfell	August 27, 28
Barellan	August 28
Parkes (L. S. Seaborn)	August 30, 31, Sept. 1
Lockhart	August 31, September 1
Young (T. A. Tester)	August 31, September 1
Ungarie	September 1
Deniliquin	September 3, 4
Murrumburrah	September 3, 4
Cowra	September 7, 8
West Wyalong	September 7, 8
Narrandera	September 10, 11
Mangrove Mountain (W. J. Mitchell)	September 11
Barmedman	September 11
Finley	September 11
Forbes Sheep Show	September 11
Canowindra	September 14, 15
Temora	September 14, 16
Hillston	September 15
Ardlethan	September 18
Leeton	September 21, 22
Quandialla	September 22
Hay	September 24 25
Ariah Park	September 25
Bribbaree	September 29
Cudal	October 1
Illabo	October 2
Griffith	October 5, 6
Walbundrie	October 6
Singleton	October 7, 8
Culcairn	October 9
Cootamundra (D. H. Boyd)	October 15, 16

1949.

West Maitland (R. E. Holroyde)	March 2-5

Orders for Seed Wheat and Oats Destroyed.

A FIRE at the homestead of Mr. George Barton, of Goonoo Goonoo road, Tamworth, destroyed, among other things, a bundle of mail, among which were orders for seed wheat and oats.

Mr. Barton has no record of these orders, so growers who have recently ordered seed from him should check up to ensure that their orders are not among those destroyed.

Mr. Barton's name appeared in the List of Growers of Approved Seed Wheat and Oats in our February issue.

GRASSHOPPER CONTROL.

Recent Developments

S. L. ALLMAN, M.Sc., B.Sc.Agr.,
Senior Entomologist,
and
J. A. WRIGHT, B.Sc.Agr.,
Entomologist.

IN spite of the undoubted efficiency of poison bran bait for control of grasshoppers* the method has not been wholeheartedly adopted by landholders. As a result, campaigns organised under the direction of Pastures Protection Boards have lacked the real co-operation necessary for success.

Reasons advanced against the bran-baiting method are many; ranging from failures by unskilled operators, scarcity of labour, clashes with such routine farm work as harvesting, crutching, etc., to the unjustified objections of those who claim, in spite of all evidence to the contrary, that insectivorous birds are wiped out.

It is unfortunate that large swarms may develop and migrate from parts of the State where big holdings are the rule and the amount of labour employed is small. Apart from the difficulty of locating swarms on such properties, and particularly in seasons of prolific growth, the loss of some thousands of acres of pasture is not very serious on big holdings if the resultant swarms take wing and follow their usual course to infest the southern and south-eastern sections of the State. These migratory swarms finally invade smaller holdings in the more closely settled country where emphasis is on cropping rather than pastures.

The potential danger to high-value crops and pastures which are usually more fully stocked to carrying capacity, acts as a more urgent stimulus for applying control measures, and bran-baiting has been used effectively under these conditions.

* The main pest species is more correctly named The Australian Plague Locust (*Chortoicetes terminifera*).

Small Section of a Winged Swarm of Australian Plague Locusts Settled on a Roadway.

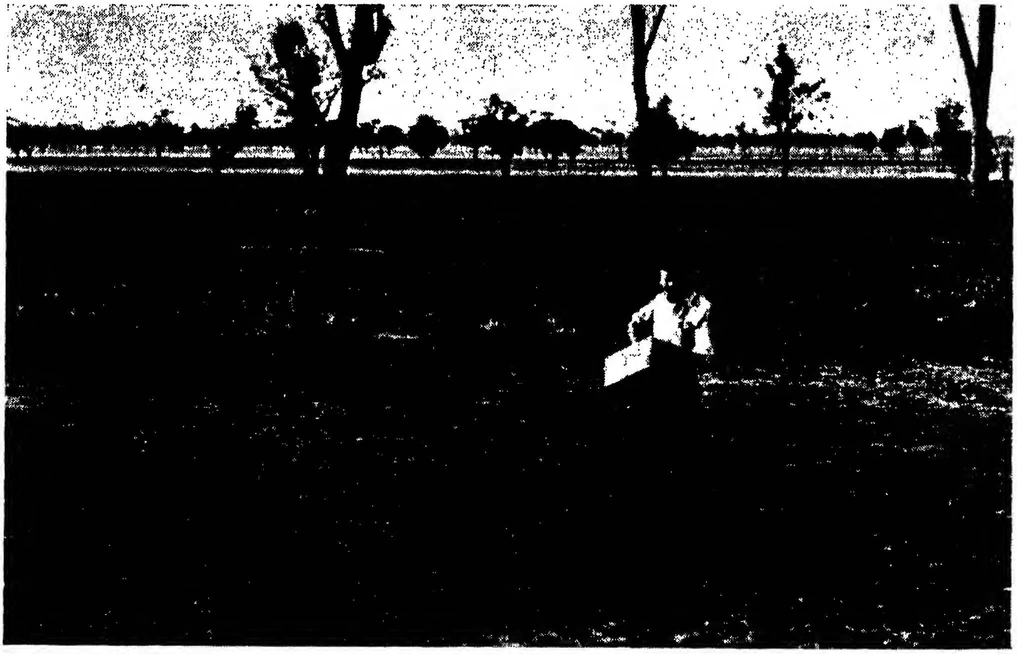
Since the inception of the Noxious Insects Act, 1934, bran bait has been distributed in most seasons and in varying amounts, and reached a peak in 1937-38 when some 7,500 tons of mixed bait was distributed.

Improved Bran Baits.

Of the new chemicals, benzene hexachloride (B.H.C.) is the only one which has been tested extensively in bran baits. The first tests were carried out against the Wingless Grasshopper (*Phaulacridium vittatum*), A bait containing 0.4 per cent. crude B.H.C. (of 13 per cent. gamma isomer content) on a dry weight basis was found remarkably effective, although the usual arsenical baits proved comparatively useless against this species[1].

These tests were then extended to cover the Small Plague Grasshopper (*Austroicetes cruciata*) and the more important Australian Plague Locust (*Chortoicetes terminifera*)[2]. Again the results proved very satisfactory. During the 1946-47 compaign the B.H.C.-bran was supplied to many landholders who voiced a definite preference for the mixture, and thereafter many even refused to use the arsenical bait. It is interesting to note that use of arsenical compounds in baits has been largely discontinued in the United States of America, having been replaced since 1941 by sodium fluosilicate.[3]

The present recommendation is a mixture of 1½ lb. of 20 per cent. B.H.C. dust (based on crude B.H.C. of 13 per cent. gamma isomer content) per bag (110 lb.) of bran. These materials are first mixed together dry, then made into a crumbly mash with 10 to



Hand Distribution of Poison Bran Bait.

The trees in the background would make low flying by planes and efficient treatment of small swarms difficult.

11 gallons of water. The dry mixture may be conveniently transported and water added just prior to use, as it has been found that the wet mixture tends to heat up and deteriorate rapidly under warm conditions.

Hoppers feeding on B.H.C. baits are obviously affected within a few minutes, and although death may not occur for some considerable time, swarms are generally wiped out in a day. Arsenical baits can be equally effective but are much slower in action and the full effects of the baiting may not be evident for three days.

B.H.C. is relatively non-poisonous to man and higher animals and is not an acute poison like arsenic. It is therefore quite understandable that the more spectacular and less dangerous mixture should be preferred. Even so, provision of this effective and relatively safe bait which overcomes some of the main objections to arsenical mixtures has not resulted in more extensive use of the baiting methods. In fact, numerous requests to abandon baiting as an inefficient and obsolete method of control have been received from landholders and various interested organisations. These have arisen from widely publicised accounts of aircraft distribution of D.D.T. in the war-time malaria-control campaigns. A similar trend is also very much in evidence in the majority of reports recently published in the U.S.A.

Use of Aircraft.

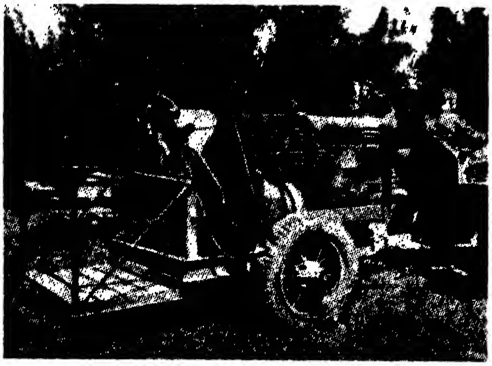
Although planes were used experimentally for a number of years for distribution of arsenical dusts to control hopper or flying swarms, such direct methods of control were not considered practicable and received little attention until D.D.T. and the new insecticides became available.[4] Curiously enough, D.D.T., which is popularly accepted as a panacea against all insects, is not particularly effective against grasshoppers.

Recent work suggests that benzene hexachloride, D.N.C. (di-nitro-ortho-cresol), and the newer insecticides Chlordane or Toxaphene (both chlorinated hydrocarbons) may prove of great value in direct control of grasshoppers. The possibility of their distribution from aircraft re-opens the whole question.

In Australia, planes were first used for grasshopper control in 1945 by the Victorian Department of Agriculture, in co-operation with the R.A.A.F.[5]

Some further tests were carried out at Gunnedah, N.S.W., in September, 1946, when mixtures of B.H.C. and D.N.C. in diesel fuel were dispersed from a modified

Beaufort Mark IX aircraft through a specially designed boom. The plane flew at 170 m.p.h. at heights varying from 30 to 80 feet above ground level, and the rate of application approximated 2 gallons of mixture, equivalent to 1 lb. of insecticide, per acre. These tests indicated clearly that both B.H.C. and D.N.C. applied in this fashion could be very effective in controlling swarms.



A Blower-type Atomising Sprayer.

Note the fishtail-shaped air-discharge nozzle, with the small pipe along the outlet. The insecticide is forced through small holes in this pipe and so into the air stream.

[*After O. C. French.*

D.N.C., which is used extensively as a weedicide, has the objectionable features of persistent yellow staining and causing plant injury, and in these tests reduced by half the subsequent crop growth. The B.H.C. mixture also caused some burn, presumably due to the diesel fuel, but this was not of any great consequence and was soon outgrown.

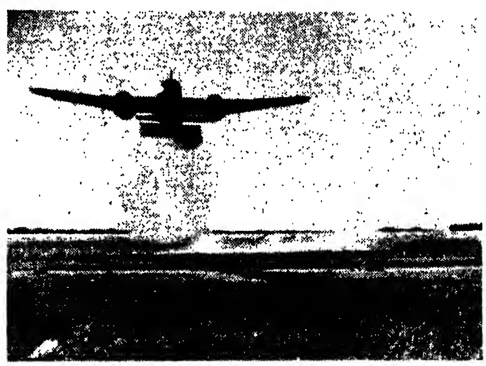
As a result of these tests it was considered that this method was suitable for crop protection but had too many practical difficulties to allow widespread adoption in any organised campaign. Perhaps the chief of these was the necessity for treatment under satisfactory climatic conditions. Ideal conditions, such as absence of strong winds and unfavourable upward air currents, can only be expected for limited periods during early morning and in the evening.

Further, grasshopper swarms are not confined to cultivated ground in regularly defined areas well cleared of timber. They cannot be detected readily from the air by observers in either fast- or slow-flying aircraft and an extensive ground organisation would be necessary to locate the swarms. These have then to be indicated clearly by means of smoke generators (or some such device) in order that the plane crew can then effectively treat the infested area. The considerable labour employed in this ground marking could be employed more efficiently in carrying out conventional control measures. In addition to the above drawbacks it is considered that economical and accurate treatment of actual hopper swarms would call for a considerably higher degree of skill than would be required for the covering of clearly delineated areas such as growing crops.

If aerial treatment is to be developed further it would seem that the helicopter is the most likely machine for use. This development has been followed more or less extensively in the Argentine during the past season when eleven helicopters were used in dispersing D.N.C. dusts. [6] The final result of this large scale field trial has not yet been made available but it seems that the measures adopted were not without a fair degree of success.

Ground Dispersal of Insecticidal Fogs or Aerosols.

The previously discussed war-time distribution of D.D.T. for mosquito control drew attention forcibly to the possibility of distributing small quantities of concentrated insecticides over large areas by means of ground-operated equipment. In the past, distribution of finely-atomised sprays had



Aerial Spraying in Operation Against the Australian Plague Locust.

[*After Hogan and Slape.*

been achieved by using an air-blast to break the concentrated mixture into very fine particles, which were then carried by the air stream over the area to be treated. The first really effective treatment of this kind was

the control of a serious infestation of leaf-hoppers in a Californian vineyard.[7] Further work along these lines has led to the use of atomising equipment for application of dormant oils on deciduous trees and of sugar-tartar emetic mixtures on citrus trees. The equipment developed made use of compressed air on the principle of a paint sprayer, or alternately, the insecticide was sprayed from an atomising nozzle into an air blast produced by a fan revolving at high speed. During the same period aerosols had also been produced by using liquefied gas as a propellent and aerosol bombs were used extensively in households and glass-houses.[8]

Naturally the idea of aircraft distributing aerosols made an immediate appeal to land-holders, but it is considered that a ground-operated machine offers a more practicable approach to the problem. Efficient machines of the type required have been developed and used against a wide variety of pests in America.[9] A machine of this type was located in Sydney and, together with skilled operators, was made available by the courtesy of Lister Blackstone Pty. Limited for tests against grasshoppers.

(To be Concluded.)

References [1] to [9] and subsequent references in other sections of this article will be given at the end of the concluding section.

Stud Romney Marsh Rams.

Purchased by Department from New Zealand.

FOUR stud Romney Marsh rams have been purchased from New Zealand studs by the Department of Agriculture.

Commenting on this purchase, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., stated that these animals would be stationed at Government Experiment Farms and would be available for service of ewes of registered stud breeders in New South Wales.

Two of the rams—"Waiorongamai 830-6" and "Waiorongamai 34T-6"—had been purchased from Mr. R. W. Matthews of Waiorongamai, Featherston. The other two—"Cranleigh 571-6" and "Cranleigh 957-6" had been purchased from Mr. J. G. Alexander, Cranleigh, Maxwell.

These rams had been selected by Mr. J. Daly, a Livestock Officer of the Department, during a recent visit to New Zealand, where he had also purchased other stud rams, on behalf of New South Wales stud breeders, said the Minister.

Purchase of these rams had been made in accordance with a promise made to the New South Wales Romney Marsh Breeders' Association, that the Department would purchase two quality New Zealand rams for use by stud breeders in a manner similar to that adopted with rams purchased by the Stud Stock Buying Delegation.

Sound Orgins of Animals Purchased.

The Waiorongamai Stud was the fountain-head of all quality Romney Marsh studs in New Zealand, said Mr. Graham, whilst the Cranleigh Stud had a very high reputation, and had been prominent in the pedigrees of top-priced stud sires sold at the Manuwatu and West Coast Stud Sheep Sale this year and in past years.

The ram "830-6", from the Waiorongamai Stud, was a very solid-fleshed sheep, most symmetrical, standing well on good-boned legs well placed over big black feet. He was of attractive carriage with a well-carried head of good sire's quality. The wool of this sheep was of nice type and good bulk.

The ram "34T-6" was one which would develop into a quality sheep. He was not as symmetrical and well-fleshed as "830-6", but was a sheep of excellent wool qualities with great bulk and nice style.

The ram "571-6", purchased from Cranleigh Stud, was a big-boned, solid-fleshed sheep, with an excellent twist and a solid, thick front, standing well and of good carriage. He was well and evenly covered with wool of good length and style.

The ram "957-6" was a very solid-fleshed, thick, short-coupled, well-balanced ram of great quality and nice finish. He had good carriage, set off by a solid sire's head of breeding. He was covered by a long-stapled, stylish wool of good quality.

"Cranleigh 571-6" and "Waiorongamai 830-6" would be stationed at Wagga Experiment Farm, said Mr. Graham. "Cranleigh 957-6" would be located at Cowra Experiment Farm, whilst "Waiorongamai 34T-6" would go to Hawkesbury Agricultural College, Richmond.

Conditions of service of these rams would be the same as those of the rams recently imported from England, and now stationed at Wagga and Cowra, the Minister concluded. The service fee for ewes sent to these rams by registered stud breeders would be two guineas per head per ewe.

Fifty-one ewes had been accepted at Wagga Experiment Farm for the Scottish Border Leicester ram "De Luxe," and five Romney Marsh breeders had brought a total of fifty-one ewes for service by the two New Zealand Romney Marsh rams, "Waiorangamai 830-6" and "Cranleigh 571-6."

THE

BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics

THE WAY TO HIGHER FARM INCOMES.

TWO of the main characteristics of primary industry are, firstly, the instability of incomes earned by farmers, and, secondly, the inequality of incomes within each branch of the industry. It is desirable to have a clear understanding of the main causes of this two-way variation in farm earnings, for each of these is a problem requiring further attention. Both the authorities and the farmers themselves have a part to play in seeking a solution to them.

Fluctuations from year to year in farmers' earnings are caused mainly by *changes in price levels* and *changing weather conditions.* Almost without exception the individual farmer cannot alter the price of the product he produces, and he cannot change the weather. He has to accept each of these as he finds it. It is true that he can expect some measure of protection from their effects on his income with the extension of such things as co-operative marketing, price stabilisation, crop insurance and any large scale irrigation scheme which includes his farm. But these are matters to be tackled by the industry as a whole and the authorities, rather than by the individual farmer.

What Then can the Farmer do?

The important point is that even though as a result of changing weather conditions and changing price levels, there is a marked variation from year to year in farm earnings, there is a far greater variation in the incomes earned by individual farmers in the same year. That is, some farmers consistently make higher incomes than others working under similar climatic and price conditions.

Why is this the case? To a large extent the answer is to be found in differences in the managerial efficiency of farmers. While some factors which influence income are outside the control of the farmer, there are many others over which he can exercise a definite control. These can be conveniently termed "management factors," and efficient management of a farm business involves paying attention to each of these.

There follows a brief summary of what are, perhaps, the most important and the most generally applicable management factors.

1. Size of the Farm Business.

By this is meant not so much size in terms of land area as the size of the farm as a business unit. An acreage basis is only really applicable when comparing farms of similar soil type on which similar enterprises are being conducted. But the organisation of farms even within a limited area varies so much that generally speaking it is the size of each enterprise conducted

that is significant rather than the total area of the farm. It may be that the latter is an important factor limiting the expansion of the former, but this does not alter the fact that there is an optimum size for the farm business under any conditions. To achieve this should be one of the aims of the farm manager.

2. Choice of Crops and Animals.

Over a certain period of years certain crops and animals have a definite advantage over others on any given farm. In addition, there is a certain combination of crops and/or animals which make for the highest income on any farm. An important role of the farm manager is to seek to determine by careful thought and planning this most profitable selection and combination of enterprises on his farm.

3. Crop Yields and Production per Animal.

On most farms there is considerable scope for the improvement of crop and animal production by—

(*a*) use of better crop varieties;

(*b*) skill and timeliness in performing crop operations;

(*c*) better selection and breeding of animals;

(*d*) use of better balanced rations;

(*e*) more economical production of feed and fodder crops.

Such improvements in management add little to cost, but much to farm income.

4. Efficient Use of Labour and Farm Machinery.

As the labour cost on most farms is approximately 50 per cent. of the total costs it is not surprising that farmers who use their labour resources most productively tend to have the highest earnings. If any aspect of farming deserves careful planning, it is the use of farm labour.

An important point, too, is that if the output of labour per man on the farm is increased, the output of machinery and equipment is increased likewise.

Expenses incurred on improvements, power and equipment need careful consideration by the farm manager. There must, of course, be a minimum investment on such items on any farm, below which earnings would be seriously restricted because of the inefficient use of other factors, particularly labour.

Very many farms are over-capitalised in the sense that certain of their improvements and equipment have added little or nothing to the farm income. They merely have made the particular farmer more susceptible to severe losses in periods of low farm prices. The successful farm manager always asks himself the question: "Would that tractor, that implement or that farm improvement really increase my income sufficiently to warrant my incurring the debt in which it would involve me?" This is not an argument against farm mechanisation, which is a necessary adjunct to efficiency under modern farming conditions. It is, however, a warning against unwise farm investment which is a common occurrence, particularly in periods when farm prices and farm incomes are temporarily at a high level.

Other Factors in Management.

There are, of course, other factors in addition to those set out above which also need the attention of the farm manager. But the aspects covered in these four sections contain the essentials of efficient farm management and maximum farm profits under the existing climatic and price conditions. And the farmer who can be said to have achieved more than the average in each of these directions will, without doubt, be amongst those farmers—be they few—who earn a very good income. In addition, it is through greater attention to one or more of the above management factors that farmers most effectively can increase their farm income.

It is quite apparent, too, that the efficient farm manager will do much to mitigate the influence on his earnings of changing price levels and changing weather conditions. He cannot pay attention to the above management factors without also achieving a great deal in this direction. The choice of the most suitable enterprises will involve the choice of crop varieties resistant to adverse weather conditions; timeliness in conducting operations means taking advantage of the "safest" period of the year; increased production per animal involves paying attention to fodder and water conservation practices on the farm; and by keeping his fixed commitments down to a reasonable

level in relation to his income, the farmer protects himself against periods of low prices.

Farm Records Necessary.

In tackling these problems conscientiously, the farmer will appreciate the necessity of keeping an adequate system of farm records. It would be very useful, too, if he had the opportunity of comparing details of his farm operations with those of others in the same industry.

There is a definite need in this country for the development of co-operative farm management services, on similar lines to those existing in the United States, in order to assist farmers along the road to better farm management. The organisations envisaged would be staffed by persons familiar with the practical problems associated with farming and trained in the analysis and interpretation of farm records. Their job would be to direct the keeping of comparable records by farmers operating under similar conditions, and to analyse and summarise these for the group as a whole in such a way that individual farmers may be able to assess their relative accomplishments in each of the main management factors applicable to their particular conditions.

But even in the absence of such a service, the alert farmer who keeps a satisfactory system of records from year to year can go a long way towards determining those management factors which limit the size of his income. Indeed, irrespective of the facilities provided to assist him, the success of any farmer in his dual role of farm manager and farm worker lies chiefly in his own hands. It is of little use knowing where the fault lies unless the farmer himself is willing to do something about it. Generally speaking, it is the farmer who continuously strives to find faults in his management who also achieves the highest level of efficiency and makes the best income. The farm business is of a complicated and variable nature, and is not easy to manage successfully.—WYN F. OWEN, Economics Research Officer.

FREIGHT RATES FOR AGRICULTURAL LIME.

SOME confusion seems to exist on this subject among primary producers. Some producers have claimed that rail freights on agricultural lime are too high, imposing an unfair burden on the man on the land, whilst others maintain that rail freights are subsidised so as to prevent local agricultural lime quarries from competing efficiently with the larger, more mechanised quarries.

There is in fact no rail subsidy on lime. Lime is carried by the railways at a comparatively low rate in accordance with the general policy to transport primary products, or those products needed by primary industries, as cheaply as possible. A subsidy on lime rail freights that took the form of completely free rail transport for the first 100 miles would reduce the cost of lime by only 8s. 3d. a ton in certain areas. This is a comparatively small amount when it is remembered that lime costs £2—£4 10s. a ton delivered on the farm.

The main possibilities for economy rest on reduction of road transport charges (up to 1s. a ton mile in some areas), increased large-scale production and bulk distribution.

A table of up-to-date rail freights on lime used for agricultural and industrial purposes is given below:

Miles.	Lime for Industrial Purposes.		Lime for Agricultural Purposes.	
	In Truck Loads.	In 4 ton Lots.	In truck Loads.	1 ton minimum.
	per ton. s. d.	per ton. s. d.	per ton. s. d.	per ton. s. d.
10	3 10	4 11	2 10	3 10
20	5 7	8 2	3 2	5 3
50	13 6	19 3	6 2	11 2
100	24 0	34 7	8 3	18 11
200	38 2	54 10	10 5	28 7
300	45 2	65 0	12 4	33 10

F. H. GRUEN, Economics Research Officer.

KEEPING RECORDS NEXT FINANCIAL YEAR?

Farmer J: I hear you are thinking about keeping some Farm Records this coming financial year.

Farmer B: Yes. That's right. 1st July is getting closer so I'll have to make up my mind soon. The trouble is that book-keeping always seems to me to be too complicated and I don't want to have to spend hours over books.

J: Oh, I wouldn't be afraid of that. The records I keep are not complicated. I think the test of a good farm book-keeping system is its simplicity. I use a Record Book put out by the Department of Agriculture. By the way, do you know that the Department has prepared a set of three Farm Record Books, one for each of the three main farming groups?

B: Yes, I have heard them mentioned. What are they like?

J: Well, there is one for Wheat and Sheep farming, one for Dairy farming, and one for Fruit and Vegetable growers. I have been using the Dairy Farm Record Book for the last four years. I believe there are thousands of farmers using these books this year and the demand for them is growing, particularly from other States.

B: How much time do you think it would take me to keep one of these books properly?

J: After you get used to the book, ¼ hour per week, though it may take longer at first.

B: Sounds all right. It would certainly help when I come to prepare my Taxation returns. I suppose there would be a place in the book to record all amounts paid by me. That would give me a check on prices, wouldn't it?

J: It certainly would. And more than that. This book, like any good records system, will make it possible for you to find out your profit or loss for the year, and help you to work out your return on invested capital.

B: How about costs?

J: It will show you your costs in any one year. And if you keep records for a number of years, you will be able to turn them to even greater use. You will be able to compare your costs from year to year and note any unexpected variations. Also you will be able to trace such things as prices paid for stock year by year. There are all sorts of ways that good records will help you. I would not be without this book, now.

B: I've just thought of something else. It should help me when I come to make plans for a new year's work!

J: That's a very important use. You can see that a farm records system shows to its fullest advantage after a year or two. And it helps you to stay efficient, too.

B: You've convinced me, all right. I think I will try keeping records as from 1st July and I'll give the Department's book a try. Where can I get it, and what is the charge?

J: Send 2s. 6d., with full details as to your address and the type of book required, to:—

Under Secretary,
Department of Agriculture,
Box 36A, G.P.O., Sydney.

FRUIT PACKING TRENDS IN U.S.A.

THE Commonwealth Department of Commerce and Agriculture recently received a report on trends in apple and pear packaging in the United States. It is interesting to compare the developments taking place in America with the existing position in the packing of fruit in this State.

While there is no substantial interest in any type of packing other than the North-West bulge box for export, the position regarding domestic packs is much more subject to change than is usually realised outside the United States. The preference of the American public for very large fruit is a powerful factor contributing to packaging conditions. To satisfy this particular requirement there has been a tendency to market fruit at progressively riper stages. As a result, much of the fruit being packed

this season was full eating ripe and, by Australian standards, would be considered dangerously over-mature for marketing.

There has been a movement away from the excessive bulge upon which earlier observers from Australia had commented. Most traders considered that the bulge has only an undesirable effect on the fruit and all regard its main function as giving a better net weight and, therefore, a greater profit to the retailer. No one appeared to be considering the fact that the stretched lid allowed for shrinking of the fruit and maintained a firmer pack. No significant changes are taking place in the buying and shopping habits of the public.

Consumer Packages.

The "Super mart" type of self-service food store is now an accepted feature of the American scene, even in small centres, and the critical selection of fruit from a bulk pile by the customer results in a rapid culling of the best fruit and bruise and damage to the remainder, which has to be disposed of at a lower price. To counter this a flood of consumer packages has appeared. Substantial proportions of oranges are already sold in mesh bags. For fruit, the following types seem most likely to survive:—

(i) *Mesh Bags*: These are widely used for oranges and come in 5 and 10 lb. sizes.

(ii) *Fibreboard Trays*: Some difficulty is being experienced in adjusting this type to apples, but it is entirely suitable for tomatoes and potatoes.

(iii) *Cardboard Box with Window*: This is a very attractive package designed to hold 4 lb. of apples and costs approximately 4 cents. per package.

Packer-to-Consumer Packaging.

The presentation of top quality fruit for distribution direct to the consumer by express carriage service has become a tremendous business and most of the big packing houses in Washington and Oregon participate. The packages are made up in refrigerated rail-car lots and sent to many centres from which they are distributed unrefrigerated. Rigid guarantees are given on delivery and condition, and the initial cost includes all charges. The main use is for gifts and they are regarded as being especially suitable for the Christmas trade. There are three main types:—

1. *Cartons*: Development seems to be selecting out two types—(*a*) single layer trays, 8" x 11" x 3¼", holding 10 to 14 fruits, and (*b*) 14" x 10" x 3¼", containing 18 to 24 fruits. These trays are made of fibreboard and, after the fruit is packed in cool store, cartons are placed in refrigerator trucks or returned to cool store immediately. The prices are approximately (*a*) $3 and (*b*) $4.50.

2. *Boxes*: These are of four main types and trays contain 10 to 14 fruits, quarter-boxes, half-boxes and whole boxes at varying prices according to the elaboration in presentation. The half-box with the light timber appears to be a possibility for Australia as the dimensions are sufficiently small for sliced hardwood to be satisfactory for all but the heads. Dimensions are 7⅝" x 8⅝" x 16".

3. *Elaborate Baskets*: These consist of shallow wicker baskets with a big handle and the fruit is built up inside the container to a fixed design. The container is then "dressed up" with trimming material covered with cellophane.

Bulk Packages.

The scarcity of timber and rising costs have made alternative containers competitive and the interest in them is vital in areas where box timber is no longer available. Furthermore, the interest in other containers has opened the mind of the trade to the possibility of an improvement in the box as a vehicle for marketing fruit. The three main types of boxes used, which are all packed without a bulge, are as follows: Virginia—11" x 13" x 17"; New England—11" x 13⅝" x 16"; Michigan—11" x 12½" x 16". A number of substitutes for the North-West box have been examined and fall into four main types:—

(1) *Cartons*: Plain cartons have found considerable acceptance for use for immediate distribution, but have been complete failures for cool storage or for long railway hauls. In addition, no satisfactory waterproof type has been evolved.

(2) *Cartons with Fruit Separators*: In some types each of the four layers are separated by cardboard, with holes cut for ventilation, and with each fruit of the

layer in a separate cell. The most satisfactory type is known as the "Friday Pack." The fruit is nested in moulded separators made from repulped newsprint. Variations in fruit count are provided for by differences in the contour of the mould so that the box is completely filled. This pack eliminates bruising. However, costs are increased to the extent of as much as 10 cents per box.

(3) *Over-size North-West Box*: Each layer of fruit is separated by a sheet of heavy crepe paper which is laid in greater thicknesses between the layers than is the usual procedure, the extra depth of the box making this possible.

(4) *Wirebound Crate*: This crate (internal dimensions 12" x 12" x 20") is of sliced wood stitched to a frame and bound with wire, and was evolved principally to overcome the objections to the carton for storage purposes. It is made to fold flat, the final securing being by means of wire ends through 3 foot wire loops so that no nailing is necessary, but for export security a further wire strapping would be necessary.

The final acceptance of these new methods in packaging will depend on the balance arrived at between their good features and the probable increased costs. There seems no reason to doubt that they reduce bruising and that unskilled labour can be used to pack them. However, the increased length of the package may increase freight charges.

Reactions to Australian Dump Box.

The report concludes with a note on the reaction of American importers to the Australian Dump Box. Objections voiced by the New York trade were all in the direction of appearance, with high-weight box and short-weight fruit of less importance. These objections would obviously become more important under more competitive conditions. Of course, the New York market is extremely sensitive to adverse factors. Strangely enough, there was no objection to the type of box in itself and the opinion was expressed several times that, given equal appearance and weight of fruit, there would be no objections to it, particularly if it could compete in price. But it was stressed again and again that the appearance of both box and fruit was all-important.—J. B. MAYNE, Economics Research Officer.

Marketing of Carrots.

Experiment in Long-distance Consignment.

To determine the most suitable type of container for transporting carrots over long distances, the Leeton Experiment Farm recently forwarded a consignment of carrots to the Sydney Markets in four different types of packages. The containers used were potato crates, tropical fruit cases, open-mesh onion bags and Chapman sacks. Two packages of each type, one containing washed carrots and the other unwashed, were included in the consignment.

The carrots in all packages arrived in a generally satisfactory condition. There was very little difference in the quality of the washed and unwashed carrots, irrespective of the type of package.

The open-mesh onion bags arrived in a somewhat damaged condition, which suggests that this type of bag is too weak for carrots. However, the design of these bags is satisfactory, and they would probably be suitable for carrots if made of better material.

The corn sacks, which are the usual form of container used, opened up quite satisfactorily, but the quality of the carrots might have been affected had they been consigned during the hot summer months. The open-mesh bags are considered preferable to corn sacks during the summer.

Retailers showed a preference for the crated carrots, but indicated that they would not be prepared to pay more than 2s. per cwt. extra for carrots packed in this way. The tropical fruit cases proved quite satisfactory, although they did not appeal as much as the export potato crates.

The general opinion was that the weight of the package of carrots should not exceed 100 lb.

The quality of the carrots was of a very high order, and despite the fact that the market was over-supplied at the time the test consignment arrived, the carrots realised about 4s. per cwt. over and above the best price realised by other carrots. This demonstrated strikingly the wisdom of marketing well-graded good-quality produce in an attractive manner. — DIVISION OF PLANT INDUSTRY.

MARKETING AUSTRALIA'S WHEAT.

TIDYING-UP THE F.A.Q.

(Concluded from page 164.)

GEO. L. SUTTON, D.Sc.(Ag.).

IN the first section of this article (published in the March issue) Dr. Sutton writes: Seeing that the bushel weight of commercial wheat is not a guide to its milling or monetary value, and is quite unnecessary, is it not farcical that leading men in the wheat trade should assemble annually and officially declare it? . . . Surely it is now time to tidy up the F.A.Q.—to discontinue the unnecessary and unsound declaration of the bushel weight of the F.A.Q., and so remove from intelligent men the stigma of doing something that is ridiculous, particularly as it is ignored even by the British buyer for whose special benefit it is intended.

I have stated the disadvantages of the F.A.Q. system and shown that it does need "tidying-up." How can this be done?

Dr. Kent-Jones, whose professional work requires that he have a specialised knowledge not only of the characteristics of Australian wheat but of all the wheat on the British market, recommended that we abandon the F.A.Q. system in favour of a modern grading system. Dr. Kent-Jones could not be expected to be familiar with the intricacies of our wheat marketing methods. Because of the prominence given to the F.A.Q. standard and the insignificant references to other units of our system it would be impossible in a short time for him to realise that our F.A.Q. standard is the principal unit or grade in an elementary or rudimentary grading system.

The principles of a grading system are that the wheat crop shall be divided into the distinct "baking quality" classes of which it is composed, and these classes into grades according to the "milling value" of each. Thus the crop is divided into units each according to its technological value. With such a sound economic arrangement no one can disagree.

F.A.Q. Was Originally a Simple Grading System.

Having regard to these principles it is believed, though not generally recognised, that Australia has had an elementary and therefore the simplest of grading systems since 1888, when the F.A.Q. method was introduced. At that time all the wheat was of the same soft (weak) class. A little red wheat was grown, but not enough to justify its segregation. There was thus one main or "standard" baking class. All the normally grown wheat was of approximately the same milling characteristics. It was mixed together so as to obtain the average "milling value" of the whole class. It became known as "F.A.Q."—representing the fair average of the season's crop. Wheat below the normal type was sold on sample as "reject," that is, rejected from the normal F.A.Q.

Thus Australia had one baking quality class with two grades, namely, No. 1, known as F.A.Q., and "reject." Later with the production by Farrer of better baking quality varieties like "Bobs," "Comeback" and "Jonathan," an additional baking class was brought unofficially into the system. It was known as the "Premier" class—with, however, only one grade, for anything failing to qualify for the top of this class was relegated to the "Standard" class. The quantity of wheat in the "Premier" class was relatively small, but important because of its value for improvement.

Then later, in Western Australia at least, there has been an additional grade in the "standard" class. This was known as No. 2 and was for wheat which, because of some seasonable disability, was below normal but better than "reject."

In the meantime red varieties have, by design, been banished from our wheat fields, and now Australian wheat, in one respect, is in one class—white.

Australian Meaning of "Standard".

It seems advisable, here, to explain that the term "standard" is used in the same way in connection with trading in Australian wheat as the term "grade" is used in connection with trading in American and Canadian wheat. And so where an Australian uses the word "standard" an American or Canadian would say "grade." In Australia, however, farmers and merchants are accustomed by usage, to regard the grading of wheat as meaning to clean it from impurities, and to separate the cleaned grain into lots according to the size of its kernels; and not as meaning, as in the Canadian and American sense, to classify commercial wheat according to its baking quality and milling value.

It is important to realise this. Neglect to do so, led to quite an erroneous conclusion from an equally useless experiment. With a desire to test the value of wheat grading for Australian conditions, a parcel of South Australian wheat was carefully graded—as this operation is understood in Australia, *i.e.*, the commercial wheat was cleaned of its admixture of foreign matter, chaff, back bone, screenings and small grain. The result was a very attractive sample, but financially it was unsatisfactory as the additional price obtained was but a fraction of the cost involved in its treatment. The erroneous conclusion was that the American system of grading wheat would be unprofitable in Australia, and this instance has been cited as a reason why "grading" according to its trade meaning should not be adopted for selling Australian wheat.

With his specialised knowledge Dr. Kent-Jones realised that our rudimentary system did not measure up to a modern grading system, and needed amendment. With this there is much agreement. He also realised that it was uneconomic and stated: "As long as Australia continues to market her wheat as F.A.Q., Australian wheat growers are losing money."

Strongest Wheats Should be Classed Separately.

It is important to emphasise that the advocacy of reform of our F.A.Q. system, so that it may become, and be more widely recognised as, a modern grading system, is not in any way, indirect or otherwise, an attempt to encourage farmers to grow stronger wheats. It is the farmer's function to grow the most profitable wheats, and these are usually the varieties that fill the most bags. The farmer can be expected to grow stronger wheats *only* when the plant breeder has produced varieties of that type which are also equally as profitable, because of high yield or other reason, as those of lower strength.

The introduction of Federation was the first advance in this direction. Its strength was rather better than other varieties then in general cultivation and it was also more prolific and profitable.

Other advances have been made since then, and now it is found that amongst the main cropping varieties there are some which, when grown under suitable conditions are appreciably stronger than the others. The suggestion, and, in effect, the only suggestion, of Dr. Kent-Jones is that the strongest of these wheats, in our present main class, should be separated from the others to form a separate class. There are sound reasons why, if possible, this should be done.

It is believed, however, that at present it is desirable to accept only one grade in this class—any wheat not reaching the requirements of the first grade to be relegated to the lower strength class.

Whenever any suggestion for marketing Australian wheat according to a grading system is made, an Australian in the wheat trade almost invariably visualises the grading system of Canada or America, with their multiplicity of grades. However, in Australia, with its similarity of wheat types (and white wheat types only), a grading system means very few grades. Indeed, the suggestion of Dr. Kent-Jones involves the introduction of only one additional grade to those already existing under our F.A.Q. system.

Millable Grain Should be Index of Milling Value.

The first fundamental and essential measure to reform the F.A.Q. system is to abandon declaration of bushel weight of commercial wheat and to substitute that of millable grain as an index to its milling

value. The next is to define, in a reliable understandable manner, the quality and character of the wheat offered so that the prospective, and possibly distant buyer may be able to assess, when the wheat is offered for sale, its baking quality and milling value.

Suggested Classes and Grades.

Suggested classes and grades to meet these requirements, and adopting the recommendations of Dr. Kent-Jones, would be:—

"Australian Strong White".

This class shall consist of white wheat with at least 90 per cent. translucent or horny or vitreous grains, this grade to be restricted to varieties not weaker in baking quality than a "strength" standard to be agreed upon. (In N.S.W. this would include vitreous samples of varieties such as Pusa 111, Pusa 4, Charter, Yalta, Kendee and Gular.

Grade No. 1.—To be dockage free, this grade shall contain not less than 97 per cent. of millable grain. The bushel weight of the millable grain shall not be less than 63 lb. It shall be free from weevils and other insects and from smutty, musty or other commercially objectionable smells.

Grade No. 2.—To be dockage free, it shall contain not less than 97 per cent. of millable grain. The bushel weight of the millable grain shall not be less than 59 lb. It shall be free from weevils and other insects and from smutty, musty or other commercially objectionable smells.

"Australian Medium Strong White".

This class shall consist of white wheat whose strength is not less than the strength standard agreed upon. In N.S.W. it would include such varieties as Gular, Fedweb, Flora, Kendee, Gabo and Ford.

Grade No. 1.—To be dockage free, this grade shall contain not less than 97 per cent. of millable grain, including 95.5 per cent. of bright and sound grain which is undamaged by moisture. The bushel weight of the millable grain shall not be less than 63 lb., and it shall be free from weevils and other insects and from smutty, musty and other commercially objectionable smells.

Grade No. 2.—To be dockage free, this grade shall contain not less than 97 per cent. of millable grain, including 92 per cent. of sound grain undamaged by moisture. The bushel weight of the millable grain shall not be less than 59 lb., and it shall be free from weevils or other insects and from smutty, musty or other commercially objectionable smells.

"Australian Standard White".

This class shall consist of white grain of starchy character whose strength is lower than that of the "medium strong white." In N.S.W. it would include such varieties as Ghurka, Ranee and Waratah.

Grade No. 1.—To be dockage free, it shall contain not less than 97 per cent. of millable grain, including 95.5 per cent. which shall be sound and bright and undamaged by moisture. The bushel weight of the millable grain shall not be less than 63 lb., and it shall be free from weevils or other insects and from smutty, musty or other commercially objectionable smells.

Grade No. 2.—To be dockage free, it shall not contain less than 97 per cent. ot millable grain, including 92 per cent. which shall be sound and undamaged by moisture. The bushel weight of the millable grain shall not be less than 59 lb., and it shall be free from weevils and other insects and from smutty, musty or other commercially objectionable smells.

All Classes—Sample Grade.

Wheat of the sample grade shall be wheat which does not meet the requirements of any of the specified grades and shall be sold in accordance to the particular description of the parcel.

General Requirements.

It will be noted:—

1. That, except for some detail rendered necessary by the special characteristics of the "strength" class, all definitions of the respective grades are the same. This simplifies the position for the country operatives.

2. That, to be dockage free, it is required that all grades contain a minmum of 97 per cent. millable grain. It is believed that the ideal prescribed percentage would be 100 because this provides for a maximum incentive or farmers to clean their wheat as thoroughly as possible. It is known, however, that with Australian methods of harvesting it is not practicable to produce 100 per cent. clean grain direct from the harvester, but it is also known that it is possible to produce 97 per cent. of clean grain—about the average percentage found in

Western Australian F.A.Q. wheat since 1922-23. Silo attendants are accustomed to evaluating commercial wheat with about this amount of clean or millable grain in it, and therefore for practical reasons it is believed advisable to fix this percentage.

3. The minimum bushel weights are defined, and these are of the millable grain so that in No. 1 it is to be not less than 63 lb. and in No. 2 is lower and may drop to 59.

4. That, in No. 1 grade, the sound wheat must be bright as well as sound; whereas in No. 2 this is not so.

5. That, in No. 1 grade, the amount of damaged wheat is limited to 1.5 per cent., and in No. 2 the permissible amount is increased to 5 per cent.

Improved System Would Not Cause Inconvenience.

Handling wheat under the F.A.Q. system is cheap, quick and adapted to Australian conditions where specially trained staff is not available for country receiving depots, and it would not be economical to use specially trained staff even if available. There need be no fear that under the suggested modernised F.A.Q. system any of these features will be lost. The present methods of handling wheat at receiving or other centres could continue. At present in Western Australia, and probably in other States, the purchase of wheat of the "strong" class is made by private treaty between the miller and growers. This could continue. With regard to the new class suggested by Dr. Kent-Jones, if introduced, the wheat to be included in this would certainly be defined by the millers or some other authority, and probably selected by it. The other and main class would be delivered by the growers as the F.A.Q. grade is at present.

It will thus be seen that the country operator would not be called upon to distinguish the classes one from the other. His function, as at present, would be to decide by visual inspection whether the parcel offered is equal to the grade or not and assess it accordingly. If his assessment were accepted by the grower the matter would be finalised. If his assessment were disputed, as in the case of a proposed dockage, the wheat in question would be referred to a central authority for a decision. In the meantime the wheat in dispute would be received into the silo in bin or stack, and the assessment placed on the warrant when the decision from the testing station had been received. There need be no more delay than at present under the F.A.Q. system.

At the testing centre it would be convenient to have a set of appropriate sieves, or an American "Kicker" or a miniature Carter Disc Separator to separate the millable grain from its admixture easily and quickly. When this is done it is no more difficult to ascertain the percentage of millable grain than it is to determine the bushel weight by a Chondrometer, and on a Chondrometer designed for the purpose. Some years ago Mr. Franklin, of Sussex-street, Sydney—the maker of the standard Chondrometer—made for me one of these Chondrometers with a bushel weight scale on one side of the bar and a millable grain percentage scale on the other. After the millable grain has been obtained from the sample, it is placed in the measure and (1) its percentage read by using the scale on one side of the bar, and (2) its bushel weight obtained by reversing the bar.

The "W.A. Standard White" Grade.

The grade known as "W.A. Standard White" was introduced in W.A. in 1925 to meet a special requirement of one of the wheat exporters. It was desired that it should resemble the average of the F.A.Q. for several years past.

As no physical sample of such a standard was in existence, it was not available for comparison, and so a definition of what such a standard should be was made. It reads:—

"W.A. Standard White Wheat shall be dry and undamaged by moisture. It shall be free from weevils or other insects, and from smutty, musty, or other commercially objectionable smells. It shall not contain more than 3 per cent. of foreign matter and screenings. There shall be at least 97 per cent. of millable grain and 95.5 per cent. of bright sound grain.

"The weight per bushel shall not be less than 62 lb."

From 1925 to 1935 this grade proved so satisfactory for use, and without difficulty, that when the Bulk Handling Act of 1935 was passed it was incorporated and became a statutory grade—the first statutory grade in Australia. It operates each year in Western Australia until the F.A.Q. standard is declared, and as this is not declared

until practically the whole crop has been delivered by farmers, it follows that the whole harvest is received and handled by country operators according to the grade "W.A. Standard White" and not according to the "W.A. F.A.Q. Standard." Everything runs as smoothly as ever it did. There are no delays and the same kind of operators still function. There cannot be a more complete answer to the unwarranted fear that the change from our rudimentary to a modern grading will require drastic and uneconomical changes in the staff and methods of our wheat marketing system.

In this connection it should be noted that there is a striking similarity in the grade "W.A. Standard White" and the proposed new Grade No. 1.

If any further evidence be needed that working to a defined standard creates no difficulties or delays and is practical, it is furnished by the experience associated with the issue of the official wheat export certificates already referred to. Certificates for over 100,000,000 bushels have been issued. There are no difficulties and the methods run so smoothly and are so practical that within half an hour after the wheat is loaded the certificate with particulars as to weight and quality of the cargo is available.

Improved System Would Eliminate F.A.Q. Uncertainty.

The suggested classes and grades conform to the requirements of modern wheat trading standards. They denote the Australian character of our wheat and indicate its baking quality and milling value, and this, combined with the fact that these are permanent standards, available at the beginning of the season as at other times, instead of variable ones, will eliminate much, if not all, of the risk now associated with the uncertainty of what the F.A.Q. standard is to be. The result will be an economic gain to wheat growers and to Australia.

The suggested amendments to the F.A.Q. system conform to the requirements of the Federal Royal Commission on the Wheat and Bread Industries. The amended system retains the advantages of the F.A.Q. and is so similar to it that it need involve no alteration nor increased cost in the procedure adopted for receiving farmers' wheat at sidings or ports.

Just as the F.A.Q. system supplanted a less suitable one, so it is believed that because of our greater expansion it is now desirable that our present F.A.Q. system, which has served its turn, should give place to a more modern one of trading according to permanent standards or grades; a system which is more in keeping with the march of standardisation and in line with the practice of other branches of commerce.

As a class our wheat growers are very progressive; they have adopted the latest methods of cultivation and harvesting, and are ever ready to experiment with new varieties of promise. They have developed our wheat resources through all the pioneering stages and have proved its possibilities. They have paid little attention to marketing methods, leaving consideration of these to millers and merchants as represented by the Chambers of Commerce. It is now believed to be the duty of these organisations, or failing them, of the State, to make such adjustments of custom and habit as will provide modern marketing methods which will ensure to the wheat grower the maximum return for his product.

Storage of Pumpkins.

PUMPKINS for storage should be selected preferably from early-sown crops as they have longer to ripen off than those from later crops.

The fruit should not be harvested until throughly ripe, as immature specimens tend to develop mould. Maturity is indicated when it is difficult to pierce the rind with the thumbnail. The pumpkin should then be cut from the vine, leaving several inches of the stem attached to the fruit. Care should be taken to avoid bruising the skin, as injuries of any type permit entry by organisms, causing decay.

Prior to storing, pumpkins should be cured for two weeks. This can be done by placing the fruit in the sun, or in the cooler months, by placing it in the sun on an iron roof. The best curing temperature is 80-85 degrees. Curing completes ripening and heals mechanical injury which may have occurred during harvesting.

Pumpkins free from frost injury should then be stored in a dry airy place, preferably on slatted shelves, and they should be examined regularly for any signs of decay.—DIVISION OF PLANT INDUSTRY.

Fig. 1.—Take-all Patch in Young Wheat Crop

PLANT DISEASES.

√

TAKE-ALL OF WHEAT.

F. C. BUTLER, B.Sc.Agr., Assistant Plant Pathologist.

TAKE-ALL is one of the most serious diseases of wheat in Australia, and not infrequently is responsible for considerable reductions in yield—even by as much as 50 per cent. in individual crops. It is by far the most important of the various root and foot rot conditions which affect wheat crops.

Take-all is caused by a soil-inhabiting fungus, *Ophiobolus graminis*, which attacks the roots and stem bases of, not only wheat, but also barley, rye and a number of grasses including barley grass (*Hordeum leporinum*), sterile brome grass (*Bromus sterilis*), the wheat grasses (*Agropyron* spp.), barren fescue (*Vulpia bromoides*) and silver grass (*Vulpia myuros*). It has also been recorded on certain bent grasses (*Agrostis* spp.) and canary grass (*Phalaris canariensis*). Oats, however, are highly resistant to take-all and therefore have a special value as a rotation crop on infected land.

So far as is known, take-all is not carried by the seed and infection of the basal regions of the plant results from diseased crop or grass remains in the soil.

Although the disease may appear on isolated plants scattered throughout a crop, it usually makes its appearance in large or small patches (see Fig. 1) in which varying degrees of severity of attack are manifested.

Symptoms of Take-all.

During the early stages of crop growth the disease occurs in the form of more or less circular patches of stunted and yellowing plants, which may later die off completely. However, the most typical take-all symptoms are premature killing of plants after heading and before grain maturation and the appearance of plants showing a "white head" condition (see Fig. 2). When such plants (especially those taken from the centre of a patch) are examined just prior to ripening, they appear stunted and exhibit reduced tillering and premature ripening of the heads. Frequently the ears are white and contain no grain; in the cases where grain is produced it is invariably small and pinched (see Fig. 2). This empty, bleached condition, referred to as "white

heads," often becomes very noticeable following hot drying winds. It should not be confused with frost injury.

Diseased plants are readily pulled out of the soil owing to the rotted state of the root system. Examination of the butts shows that the outer basal sheaths vary from grey to black in colour (see Fig. 3) and are sometimes studded with small, black spherical bodies which contain the spore of the causal organism. A fairly constant feature is the occurrence of a dark incrustation or plate of mycelium (fungal threads) which adheres to the straw and which usually flakes off readily if scratched. This dark coloured mycelium is normally developed both on the surface of the culm itself and in between the leaf sheaths.

The basal joints and interjoints may show markings in the form of spots, streaks or uniform discolourations which vary from light-brown to jet black in appearance; often the straw presents a "freckled" appearance — brownish or blackish dots and streaks against the brownish discoloured portion of the interjoint. Sometimes the straw exhibits no evidence of infection, the damage being confined to the roots.

Many of the features of take-all affected plants are to be observed on specimens affected by foot rot (*Helminthosporium* spp.), but, generally speaking, occurrence in well defined patches, the freckled appearance of basal interjoints and the presence of an incrustation of fungal threads serve as distinguishing characteristics of plants affected with take-all.

Conditions Favouring Take-all.

The occurrence of the disease is markedly influenced by soil and weather conditions. Its incidence appears to be especially affected by two soil factors—soil texture and physical condition and soil reaction. Even though wheat is grown on infested land, take-all often will not develop unless special circumstances prevail. From investigations conducted in Australia, it appears that the disease is likely to be more serious in light soils which are loose and poorly compacted; in new land which has previously been under grass; in alkaline soils; in soils where fallowing or rotation with oats has not been practised; in land previously under lucerne for some years; in crops which have been fed-off or which have suffered frost injury near ground level; in soils which have been irrigated; and during seasons of very low or very high rainfall.

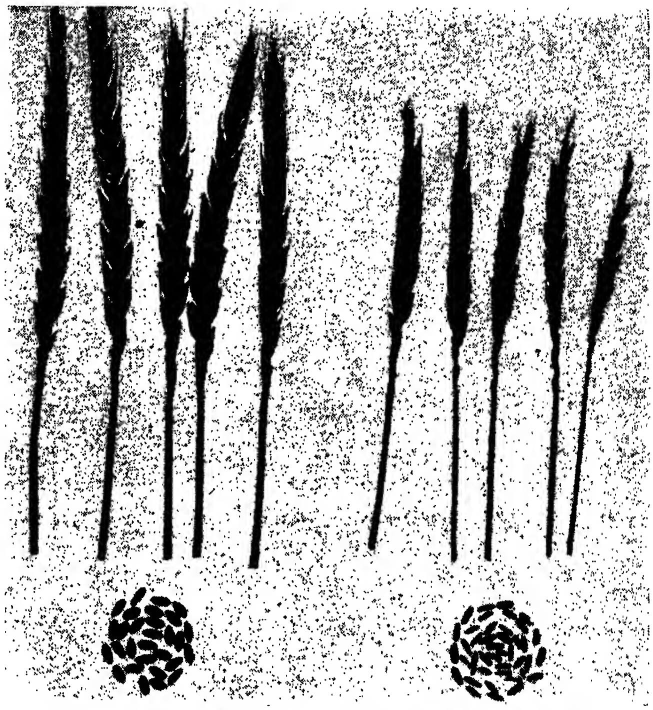


Fig. 2.—" White-head " condition on right with small, pinched grains produced by Take-all affected plants. Normal wheat heads on left with large, plump grains produced by healthy plants.

The take-all fungus lives over in the soil on infected wheat stubble or on naturally occurring grasses, particularly barley grass. On well-worked fallow a large proportion of the fungal material is killed out by the antagonistic action of other soil-inhabiting organisms, which multiply rapidly in well cultivated land. Although spores of the fungus may be produced during spring in tiny, black cases on the basal sheaths of affected plants and are widely distributed

following rainy weather, they are short-lived, and it would appear that the disease originates mainly from small pieces of infected leaf sheaths and roots of wheat and barley grass plants which are blow over clean areas. From the centres of infection thus established, patches of infected plants subsequently develop throughout the crop.

Field observations and experiments in Australia and other countries have shown that there are no varieties of wheat resistant to take-all; hence, the disease is controllable only by the adoption of sound cultural practices.

Fig. 3.—Bases of Young Wheat Plants Attacked by Take-all.
Note characteristic blackened areas on the lower parts of the stems and rotted state of the root system.

Control Measures.

1. Use oats as a rotation crop. Because oats are resistant to take-all the effect is to starve the causal fungus out of the soil. Crop rotation also assists in building up the organic matter content of the soil, thereby stimulating bacterial activity and helping to kill out the fungus.

2. Never grow successive crops of wheat on infected land. Such a policy favours the development of take-all and there is no doubt that much of the damage caused by this disease in the past has been due to over-cropping with wheat. Moreover, barley which is also susceptible to take-all should not follow wheat, nor should wheat follow barley on land where the disease has been in evidence.

3. Barley grass country should never be sown directly with wheat. It is much safer to grow first a crop of oats in such country and thereafter practise a fallow-wheat-oats rotation.

4. Bare fallowing helps to starve out the causal fungus. Best results are obtained when fallow land is kept clean of all grasses which are susceptible to take-all.

5. Avoid ploughing through take-all patches when the land is in a very dry and dusty state, as this assists in spreading the disease more widely. Under Australian conditions there is evidence to suggest that late fallowing is worse than not fallowing at all. The reason, apparently, is that late fallowing only serves to distribute the fungus present on the stubble and on the grasses of stubble land, and does not provide an adequate programme for starving it out. Early fallowing, however, is regarded as particularly beneficial.

6. Sow varieties at the correct time of year as determined by their seasonal characteristics. Early maturing varieties should be sown late and late maturing vareties should be sown early. Feeding-off is undesirable and should be avoided as much as possible.

7. Burning-off is not recommended unless take-all infection is extensive. It leads to a rapid depletion of soil humus and aggravates soil erosion problems.

8. A degree of control can be achieved by sowing the grain in a firm, well-compacted seed bed. Such a seed bed can only be obtained by early preparation and sufficient working of the land at the correct times so that the underlayers become consolidated by the joint action of implements and weather. Loose, poorly compacted soils favour the development of take-all. Such soils result from too late and hasty preparation of the land, the ploughing in of long straw or dry grass, and dry ploughing and working.

9. A healthy, well nourished plant is able to survive take-all attack more successfully than an unhealthy, poorly nourished plant. For this reason, the use of superphosphate, which helps the young plant to become well established and favours the development of a strong root system, is recommended.

A Planting Policy for the—

FRUITGROWING

CANNING PEACH INDUSTRY
In the Murrumbidgee Irrigation Area.
THE VARIETAL ASPECTS.

(*Continued from page* 215.)

B. OWEN FRENCH, B.Sc.Agr., H.D.A., Fruit Officer (Research) and
A. E. VINCENT, Fruit Inspector.

IN the first instalment of this article, which appeared in the April issue, the authors discussed the influence of the planting of canning peach varieties on the Murrumbidgee Irrigation Area, in accordance with the growers' need of high yields without due consideration of factory capacity and requirements. Statistics of recent varietal plantings and estimates of future production were quoted, showing a position regarded as serious.

The current instalment sets out the processing problems associated with this concentration on several varieties.

Processing Problems.

Establishment of a canning factory involves a large capital outlay for plant and machinery, and interest and depreciation on them are important factors in processing costs, as they constitute overhead expenses which must be covered during the few short weeks of the canning season. The more tons of fruit canned by a given size plant during the canning season, the smaller will be the overhead charge against each tin of final product. This reduction can be achieved by either increasing the daily output or by using the plant and machinery for a longer period.

As a factory manager will aim to have only that amount of machinery which can be fully employed at its most efficient level of production it would seem that the greatest scope for the reduction of overhead costs lies in the direction of lengthening the production period. If production was spread evenly, the lengthening of this period by as little as one week—from four to five weeks—would reduce these overhead costs by as much as 20 per cent. Such a saving could not be obtained so readily by any other means in a reasonably efficient commercial factory.

The spreading of the production period can reduce overhead costs in three ways. In the first instance it may operate by reducing production at the peak period and spreading that production over some other part of the canning season, and in this way do away with a certain amount of machinery previously required during the peak; the same crop could thus be handled by reduced plant.

In the second case, the production of slack periods may be expanded to increase the output of that machinery which, except during the peak, would otherwise be idle. This would only be applicable where production developed gradually over a fairly long period, but it would mean that the same plant would handle more crop in the same length of season.

In the third case, production may be induced at a time when previously there was none, and in this way the machinery kept working for a longer period; as in the second case the same machinery would thus handle more crop, but in a longer season.

These points are important when it is realised that at the present time a major part of the Murrumbidgee Irrigation Area peach crop is delivered to canneries in fulfilment of contracts between growers and canneries. Thus the canneries must have sufficient plant and machinery to handle the peak deliveries. If the peak deliveries are received over a very short period and constitute a large proportion of the crop, a

relatively large proportion of the cannery machinery must be either out of operation or working at less than full efficiency, both before and after, the peak period.

The graphs of Figs. 4 and 5, which show weekly receivals of peaches at the Leeton Co-operative Cannery expressed as a percentage of the total for the year, illustrate the local problem, and show how quickly the season develops and how practically the whole of the deliveries are made within a 4- to 6-week period.

In 1940 peach receivals at the Leeton Cannery commenced during the second week in January, but weekly totals did not exceed 4 per cent. of the total crop even by 4th February. However, by the first week in March they had risen to 15 per cent. and in the following week were 29 per cent. of the total crop. In the next two weeks receivals fell off to 17 per cent. and 19 per cent. respectively, and by the first week in April they had again fallen to 5 per cent. The graph for 1946 (Fig. 5) tells a similar story; in fact these two are typical of those taken from records over the last ten years.

These graphs demonstrate the suddenness with which the season develops and declines, but a further important point is the length of the peak period. As a measure of this the time during which the first 25 per cent., the middle 50 per cent., and the final 25 per cent. of total crop was received for various years has been graphed in Fig. 6. Table 1 sets out the number of days covered by the middle 50 per cent. period. From these graphs it can be seen that it takes anything up to three times as long for the first 25 per cent. of the crop to come in as it does for the next 50 per cent.

TABLE 1.—Number of days in middle 50 per cent. period at Leeton Co-operative Cannery.

Year.	No. of Days.
1938	18
1939	16
1940	12
1941	21
1942	19
1943	19
1944	16
1945	17
1946	15
1947	16
Average	17 days.

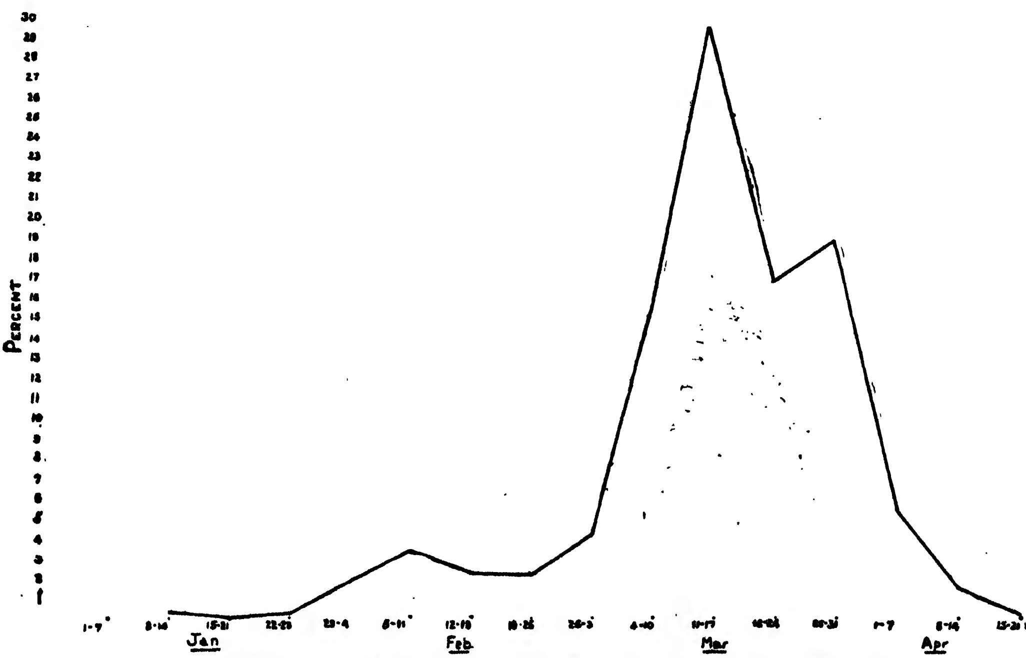


Fig. 4.—Weekly Receivals of Peaches at Leeton Cannery, as Percentages of Total Crop—1940.

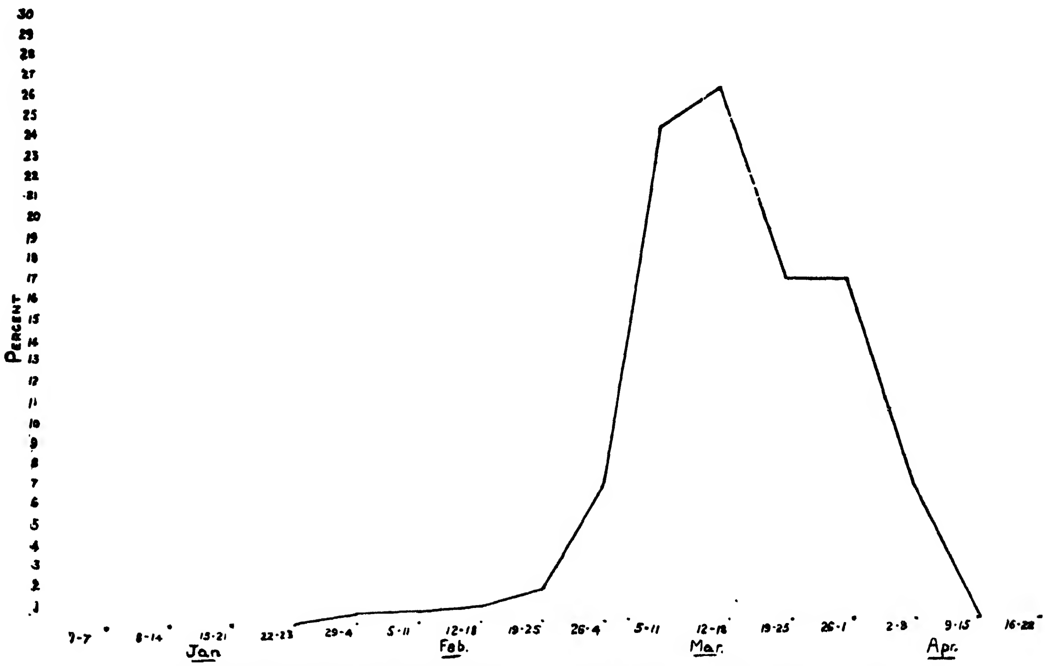


Fig. 5.—Weekly Receivals of Peaches at Leeton Cannery, as Percentages of Total Crop—1946.

Table I shows an average of 17 days for receipt of the middle 50 per cent. It is obvious that to spread this period, even by an extra five days, must mean a considerable saving.

Canning of Other Fruits.

It is perhaps unfair to consider this matter solely in relation to peaches, as, in fact, other canning fruits are important items of production. The fruit canning season commences with Trevatt apricots which are usually harvested somewhere about the third or fourth week in December; once these are finished local canneries must ease off, except for a small canning programme in pears and tomatoes, until the peaches commence in earnest during the third or fourth week of February.

It might well be asked why these other kinds of fruit are not used as a means of filling in the gap. This is a matter which should receive more consideration than it has up to date, but some of the factors which have concentrated attention on peaches are as follows.

The first and probably the major consideration, is that canning peaches are a much more important crop in present-day economy than any other canning fruit or vegetable, and by virtue of the fact that the larger part of the crop is harvested within a three-week period they offer a distinct problem in themselves.

Next, the canning of tomatoes and other vegetables is a relatively new industry, and involves many problems in marketing, processing and field production which have yet to be worked out.

Then, it has been accepted, although possibly erroneously, that Murrumbidgee Irrigation Area conditions are not suited to the production of the best type of canning pears.

Finally, there are, as yet, no new varieties of apricots which could be considered likely to extend the apricot season on the Murrumbidgee Irrigation Area.

Cold storage has been used successfully as a means of smoothing out irregularities in the daily flow of fruit, resulting in small excesses above daily production capacity, but the relatively high cost of construction and operation rule it out as a means of handling any large proportion of a cannery's production.

The Problem of Seasonal Labour.

The discussion so far has related to the cost aspect, but the labour factor also has an important bearing on the problem. As

the canneries operating on the Murrumbidgee Irrigation Area must induce seasonal labour to leave the centres of population and seek employment on the Area, it is clearly important that they should be able to offer an extended period of continuous employment. The longer the period of employment offered, the easier it will be to get labour.

Another important labour factor is that a short production period does not permit labour to become fully trained and so reach the highest possible degree of efficiency.

ber of new crossbred varieties for testing, by courtesy of Dr. W. F. Wight of the United States Department of Agriculture, and these, together with a number of other selections have been under test in Departmental trials.

Murrumbidgee Irrigation Area canning interests have been most co-operative in testing these varieties by canning samples each year and these samples have provided the basis for two canning peach conferences —held in 1946 and 1947. These conferences have been attended by representatives from

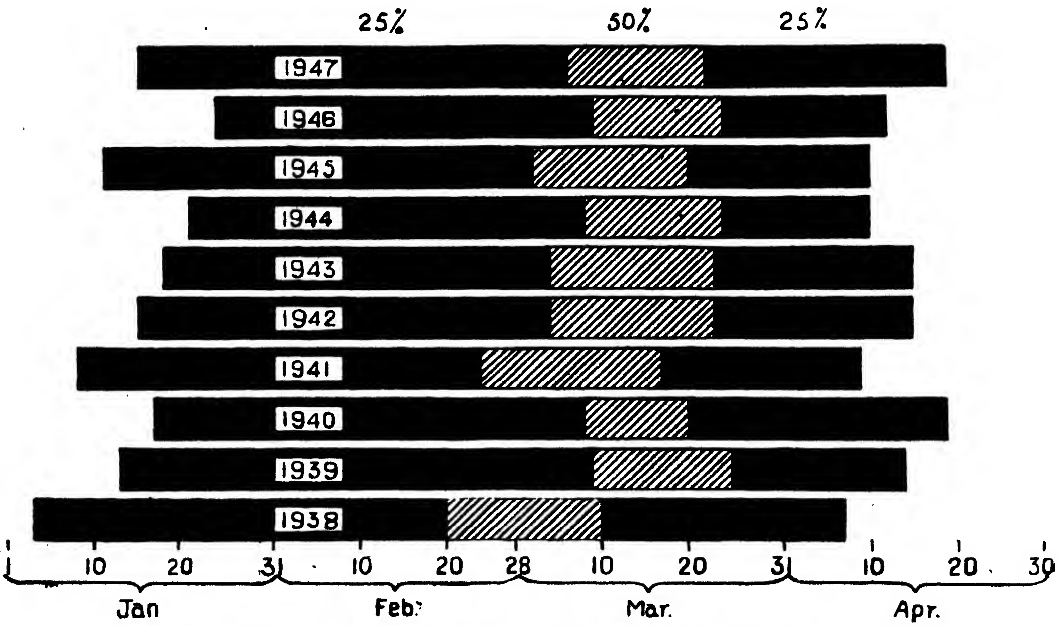


Fig. 6.—Length of Season and of Peak Periods of Receivals (Middle 50 per cent.), Leeton Cannery, 1938-1947.

New Varieties Under Test.

In view of the advantages to be gained from spreading the production period, and the serious problems which arise from any reduction in its length, the marked tendency for concentration on the Golden Queen variety has alarmed the Murrumbidgee Irrigation Area canning peach industry, and consequently increasing attention has been paid to the possibility of selecting a number of peach varieties to fill in the gap between the end of the apricots and the beginning of the existing peach harvest.

Some years ago the New South Wales Department of Agriculture received a num-

canning and grower interests as well as members of government institutions associated with the agriculture of the Area, such as the Council for Scientific and Industrial Research, the Rural Bank of New South Wales and the Water Conservation and Irrigation Commission. The samples of canned fruits have been assessed by a tasting panel and the results obtained discussed along with the year's observations on field performance.

It is proposed to present the data from the canning tests and field observations in later sections of this article.

(*To be continued.*)

RECENT MINISTERIAL ANNOUNCEMENTS.

Road Transport of Superphosphate—Permits to be Granted.

WHEAT farmers who are experiencing delays in delivery of superphosphate can obtain from the Commissioner for Road Transport special permits to make use of road transport to obtain their requirements.

Announcing that decision, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) stated that no objection would be raised to farmers arranging for superphosphate to be delivered by road transport; that is it could be carried in their own motor vehicles or by licensed carriers.

Farmers who desired to take advantage of this decision should make application for a special permit to the Commissioner for Road Transport or to the nearest Motor Registry.

The permit would cost 1s. and would exempt the farmer or carrier, when transporting superphosphate, from payment of charges normally payable under the State Transport (Co-ordination) Act.

It should be clearly understood that the permit was issued for transport of superphosphate only. A farmer or carrier was not permitted to carry any other produce and material on the forward or backward journey.

Wheat Stabilisation—Minister Confers with Growers' Representatives.

A CONFERENCE of representatives of wheat-growers' organisations was held last month under the auspices of the State Minister for Agriculture (Hon. E. H. Graham, M.L.A.). Conference was attended by representatives of the Wheat-growers' Union and of the Farmers' and Settlers' Association.

Mr. Graham stated that he had convened the conference to discuss with wheat-growers' representatives, possible action following the failure to reach unanimity in the negotiations at Canberra recently. At the Canberra conference, representatives of the Commonwealth and State Governments had considered the Federation's proposals for stabilising the industry.

Mr. Graham said later that since he had issued the invitation to wheat-growers' representatives to meet him, the International Wheat Agreement had been announced, and this made it necessary to review existing stabilisation plans. Mr. Graham said he was keeping in touch with the Commonwealth Government in regard to the International Agreement and its probable effect on wheat industry stabilisation plans within Australia. He was anxious that a stabilisation plan should be agreed upon by all concerned so that it could be implemented in the event of the International Wheat Agreement failing to achieve its announced objectives.

Mr. H. Robertson, President of the Farmers' and Settlers' Association, and Mr. L. Bourke, on behalf of the Wheat-growers' Union, had promised the full support of their respective organisations for action by the State Government in its endeavours to assist the wheat-growing industry in achieving stabilisation.

New Chief of Division of Information and Extension Services.

Mr. H. Parry Brown, B.Sc.Agr., B.A., has been confirmed Chief of the Division of Information and Extension Services of the N.S.W. Department of Agriculture, after acting in that position since the retirement of Mr. C. C. Crane in November, 1947.

Mr. Parry Brown, who commenced his Department of Agriculture career in 1929 as a University Trainee in the Faculty of Agriculture, is experienced in technical research as well as in administrative, organising and educational phases of the Department's activities.

From 1933 to 1941 as a Plant Pathologist in the Biological Branch he was responsible for the development of control measures for long-known diseases of fruit trees and

crops and for the identification of the causes of various new diseases.

Since his transfer from the Division of Science Services to the Division of Information and Extension Services he has shown an aptitude for the organisation of agricultural education and the administration of informational services in general.

Heavy Penality for Breaches of Branding-of-Fruit-Cases Regulations.

MANY growers are disregarding the regulations governing the branding of fruit and tomato cases.

Commenting on these breaches, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) stated that the regulations required all cases containing fruit or tomatoes to be legibly branded or labelled on the outside with the name and address of the person by whom the fruit was packed, or with other prescribed particulars. Old names and brands should be obliterated.

Growers not familiar with the requirements should consult their local fruit inspector or communicate with the Department, said Mr. Graham. Fruit or tomatoes in cases not properly branded or labelled in accordance with the Act would not be allowed to be sold and the grower in addition rendered himself liable to a penalty of £50.

Junior Farmers to Compete in International Stock Judging Competition.

THREE members of Junior Farmers' Clubs are to leave by the "Orion" for England on 4th May to compete in the International Stock Judging Competition at the Royal Show, York, this year.

The boys are Ken Henry, of the Numbaa Junior Farmers' Club, Nowra; Jack Martin, of the Albion Park Junior Farmers' Club; and Allan Turner, of the Kiewa Valley Junior Farmers' Club, Victoria.

Horses Leaving Tick Areas Must be Dipped or Sprayed.

REGULATORY dipping or spraying of horses leaving the cattle tick quarantine areas is to be rigidly enforced, states the Hon. E. H. Graham, M.L.A., Minister for Agriculture.

From time to time objections have been raised by stockowners to the treatment of horses leaving tick quarantine areas or crossing from Queensland into New South Wales from infested areas and not infrequently applications have been made for the waiving of the regulations regarding dipping or spraying of such animals said Mr. Graham.

A year or so ago, when horses from the Northern Territory were brought into New South Wales without treatment, they were found to be carrying ticks, and the Department of Agriculture had been put to considerable expense in ensuring that this pest was completely destroyed.

The necessity for rigid enforcement of the regulations, the Minister pointed out, was well illustrated by the experience of New Caledonia. During the war years Queensland horses had been taken to this island for military purposes, but no precautions had been taken to rid them of tick before they were embarked. Cattle ticks were now present throughout the island and had multiplied to such an extent as to make heavy infestations fairly common. In order to gain control of the pest, French authorities had had to construct 160 dips for the treatment of infested cattle.

Use of Farmyard Manure on Lawns.

FARMYARD manure should be used with discretion where lawns are concerned. It sometimes attracts insects and if used in large quantities may leave a residue of organic matter which may prove harmful if allowed to accumulate from year to year. There is also the certainty that weed seeds will be introduced in farmyard manure; many of the most troublesome weeds are introduced in this way.

Fine, well-decomposed manure may be applied lightly to lawns with beneficial results, but the best use to which this material can be put is to utilise it as a means of forming a compost with leaves, grass cuttings, loam and sand.

INSECT PESTS.

Notes contributed by the Entomological branch.

INSECT PESTS OF BEANS.

THE principal pests of beans are the bean fly, the red spider, the green vegetable bug, aphids, thrips, the leaf-hopper or jassid, and the bean "weevil." Pests of lesser importance that occur mainly in localised areas are the green mirid bug, pseudo-loopers, the tomato moth, the bean butterfly and the bean pod borer.

The Bean Fly.

(*Agromyza phaseoli.*)

The bean fly is essentially a coastal pest in New South Wales, where it occurs from the Queensland border to as far south as Wollongong. It is also a pest of beans in the Moree district. All climbing types, as well as bush types, of beans are attacked, but broad beans are not infested.

This insect is a summer and autumn pest and is not troublesome in spring. The damage to the plant is caused by the maggots or larvae of the fly, which feed within the stem. The adults, which are small black flies measuring about 1/12 of an inch in length, may be seen on the leaves as soon as the plants are well through the ground. The flies lay their eggs in the leaves and within two days in warm weather the larvae hatch from the eggs. At first the larvae tunnel through the leaves, then they burrow down the leaf-stalks and finally make their way into the stem.

The larvae become fully-fed in about eight or nine days, then enter the pupal stage within the stems, and about nine or ten days later emerge as adult flies. The life-cycle from egg to adult may occupy less than three weeks in summer, but under cooler conditions development is much slower, and the period may be three to four months.

During winter there is heavy mortality in all stages of the fly, and with the greatly reduced rate of development, very few flies survive to infest spring crops. Infestation is usually extremely light in all sowings made between June and October, but in most areas, by about the end of December, the flies have so increased in numbers that they cause severe infestation in sowings made at this time. Infestation usually continues to be severe, along the central coast until about the end of April and on the north coast until about the end of May.

As the larvae destroy all the inner tissues of the stems, severely infested plants turn

Bean Plants showing Damage Caused by Larvae of the Bean Fly.

yellow when they are about eight or ten days old and commence to fall over and to die off. In lighter infestations, the plants become yellow, and the stems swollen and cracked and easily broken off by wind.

Control.

The following sprays are recommended for control of bean fly:

1. D.D.T. emulsion (20 per cent.	.. ..	3 fluid oz.
Water	.. ..	4 gallons.
or		
2. Nicotine sulphate	..	1 fluid oz.
White oil emulsion	..	6½ fluid oz.
Water	.. ..	4 gallons.

It is important that the first application of spray be made when the first plants which show through the ground in any particular sowings are not more than three days old. For instance, plants commencing to show, say, on Monday morning, should be sprayed on Wednesday. The second spraying should be made three days after the first, and subsequent applications at intervals of four days.

A regular spray schedule is most important and must be adhered to in order to destroy the adults on the leaves and the eggs and larvae from time to time in the leaf-blades, as when the larvae enter the leaf-stalks or the stems they are not affected by the sprays. Neglect of even a day in the routine applications may enable sufficient maggots to enter the stems and cause serious injury.

In most areas where bean fly occurs, sowings made in January and February and up to the middle of March should be sprayed six to eight times, or until blossoming commences; while sowings made during the latter half of March, at the approach of cool weather, should receive four to six applications, and April sowings only two to four sprayings.

Only the upper surfaces of the leaves need to be sprayed, and 40 gallons of spray mixture usually is more than sufficient to spray an acre once.

Red Spider.

(*Tetranychus urticae.*)

The common red spider is a small mite, the adults of which are just large enough to be seen without magnification. It has a wide range of host plants and may cause serious injury to bean plants during dry weather.

These mites, which vary in colour from greenish-grey to brick-red, occur mainly on the undersides of the leaves, where they both feed and spin fine webs over the surface. The leaves become mottled in appearance, and, where infestation is severe, may turn yellow and fall prematurely. Most damage is caused during January to April.

The mites thrive best in hot, dry weather, when their life-cycle, from egg to adult, is nine to eleven days. Many generations may occur during the year.

Control.

Clean cultivation to destroy weeds which may harbour the pest is important in preventing infestation. Red spiders may be observed crawling over the ground in the vicinity of heavily infested plants, and therefore any old infested and spent bean plants should be turned under without delay to prevent the mites spreading to adjacent uninfested crops.

A dust consisting of a mixture of fine sulphur two parts and hydrated lime one part (by weight) may be used to control the mites on bean plants. The hydrated lime is added to act as a "carrier" and to give an even distribution of the sulphur. About 50 lb. of sulphur (75 lb. mixed dust), applied with a duster, is sufficient to treat an acre. A second application of dust should be given a week later. Control measures usually are only required during summer and early autumn.

Green Vegetable Bug.

(*Nezara viridula.*)

Bean plants may become heavily infested with this bug, and although large numbers of the adult bugs may be present in a crop, they are not readily seen on account of their protective green colour.

All parts of the plants may be attacked, but the most noticeable injury is caused to the bean pods. Young bean pods are the preferred food, and they become shrivelled and distorted as a result of bugs puncturing and sucking the sap from them. Well-developed bean pods may become pale-coloured, dry and blotched in appearance.

The bugs overwinter as adults, and commence to lay their eggs about the middle of September, and become most numerous during February and March.

Control.

Clean cultivation is an important factor in control, and as the bugs congregate amongst the leaves of old and spent plants, destruction of these, together with the bugs thereon, helps to prevent increase and re-infestation.

The immature bugs may be dusted with pyrethrum powder mixed just before use with an equal quantity of 2½ per cent. nicotine dust. They may also be destroyed by spraying with D.D.T. emulsion—3 fluid oz. of a 20 per cent. emulsion, to 4 gallons water; but, to avoid the danger of poisonous residues occurring on the pods, crops should be treated at blossoming time or while the pods are still small.

In most districts this pest is now largely controlled by the introduced wasp parasite, *Microphanurus basalis,* the larvae of which develop within the eggs of the bug.

Aphids or Plant-lice.

(*Aphis* spp.)

During the spring French beans are subject to heavy aphid infestations which may cause serious damage, especially in dry weather. Aphids feed by puncturing the tissues and extracting the sap from the plant and cause curling and drying of the leaves. Young plants may be attacked soon after they appear above the ground. On older plants the undersides of the leaves become infested, while all parts of the young growth may be covered. Where infestation continues to be severe for some time the plants become very stunted and there is a considerable reduction in yield.

Aphids also spread mosaic disease of beans which itself may seriously affect yield.

The aphids most commonly found on beans are small, dark-brown or black species. The winged forms migrate to the plants first, and these give birth to living young which become wingless females.

Broad beans are very susceptible to aphid attack and the young growth, flower buds and forming pods may become stunted and deformed, while the leaves below may become spotted by the quantities of "honey-dew" which the aphids excrete.

Aphids on Young Bean Shoots.

Control.

Spray with:

1. Nicotine sulphate	..	1 fluid oz.
White oil emulsion	..	6½ fluid oz.
Water	.. ..	4 gallons.
or		
2. D.D.T. emulsion (20 per cent.	.. ..	3 fluid oz.
Water	.. ..	4 gallons.

More than one application of spray may be necessary. In some seasons aphids are kept in check by insect predators and parasites.

Thrips.

(*Thysanoptera.*)

Thrips are small, delicate insects which feed by means of rasping or scraping away the surface of the plant cells and then sucking up the sap which exudes. They infest various weeds, etc., as well as cultivated plants, and feed mainly on the under-surfaces of the leaves. They also attack the flowering portions and very young pods of bean plants. The pods may become curled and distorted owing to the injury.

Control.

The plants should be sprayed with D.D.T. when three weeks old and again just before blossoming.

Formula:

D.D.T. emulsion (20 per cent.)	3 fluid oz.
Water	4 gallons.

The mixture should be applied as a coarse driving spray and as far as possible to the under-surfaces of the leaves.

Bean Leaf-hopper or Jassid.

(*Empoasca* sp.)

Leaf-hoppers are small, yellowish-green insects, which migrate to beans from adjacent weed growth, or from old bean plants. In their adult stage they are winged, and when disturbed both hop and fly for short distances. They are usually found beneath the leaves, where, in their adult and immature stages, they feed by sucking the sap from the plants. The older leaves become curled and develop irregular yellow patches, that later become brown and die.

Control.

Spray with D.D.T. emulsion (20 per cent.), 3 fluid oz., water, 4 gallons.

The Bean-seed "Weevil."

(*Bruchus obtectus.*)

Both the larvae and adults of this insect attack bean seeds, either in the field or during storage. In the field the beetles lay their eggs on the pods. The grubs enter and feed inside the developing seeds, and soon after the crop is harvested the grubs are ready to pupate or enter their chrysalis stage and develop into adult beetles. In storage the beetles lay their eggs amongst the seeds and the grubs that hatch from the eggs eat their way into the seed. If uncontrolled the weevils will continue to breed in storage until finally the seed is destroyed.

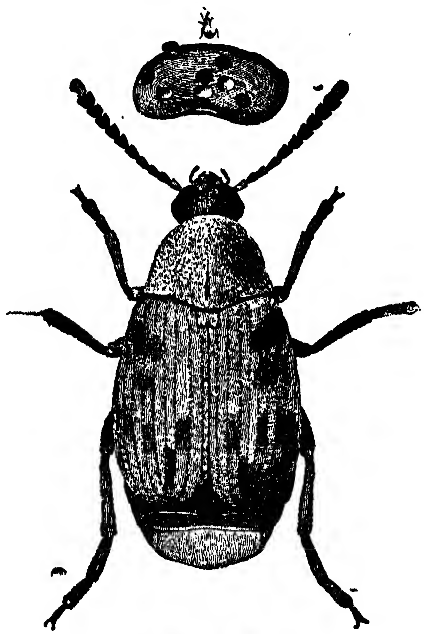
Control.

The insects may be controlled by dusting the seed beans thoroughly, with either copper oxychloride or kaolin, the quantity used being 1 lb. of either dust to 1 bushel (60 lb). of seeds. The copper oxychloride is poisonous.

Every seed must be coated with the dust. This will prevent the small larvae from eating their way into the seeds, but larvae already feeding within will continue to develop and later emerge as adults. The dusts, however (copper oxychloride and kaolin in particular) will prevent these adults from causing further infestation.

Clean seed may be protected from infestation by storing in stout muslin bags or in large tins which the weevils cannot enter.

Infested seed should be fumigated for 24 hours with carbon bisulphide, in an air-tight container, using 1 fluid oz. to 16 cubic



The Bean "Weevil."

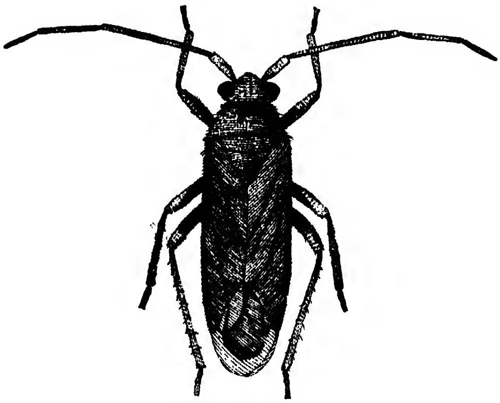
feet of air space. After fumigation the seed should be spread out to dispel the fumes.

WARNING.—No lights of any description (pipes, cigarettes, fires or embers, radiators, stoves, etc.) must be allowed in or near sheds or buildings during the process of fumigation with carbon bisulphide. The precaution should also be taken to cut off the electric current, and steam pipes should be allowed to cool before proceeding with fumigation.

Green Mirid Bug.

(*Megacoelum modestum.*)

In some seasons a small green mirid bug, which measures a little more than one-sixth of an inch in length, attacks bean plants. The bugs attack the growing shoots and the



Adult of Green Mirid Bug.

flower buds, preventing further development and causing a condition known as "blind eye" which results in considerable reduction of crop. Injury of this kind is usually confined to the months of October and November.

Control.

Spray with D.D.T.

Formula:

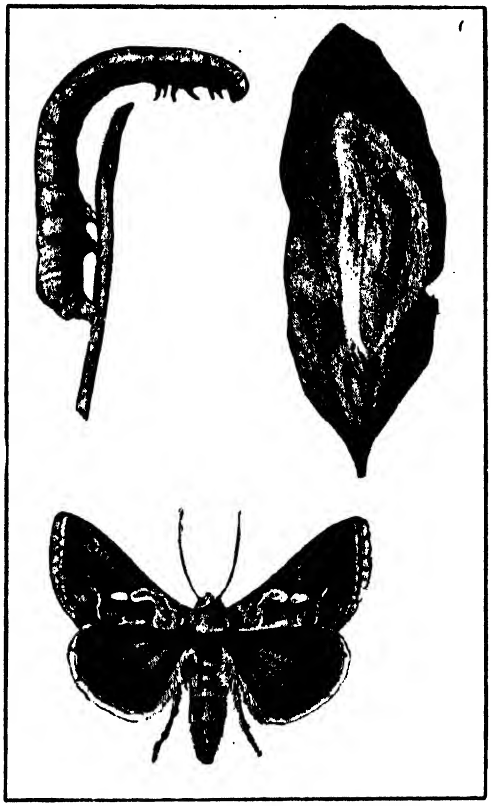
D.D.T. emulsion (20 per cent.)	3 fluid oz.
Water	4 gallons.

Caterpillars.

The Pseudo-Looper Moth.

(*Plusia* spp.)

The caterpillars of this moth, which measure up to 1½ inches in length, have a characteristic looping action when crawling. The fully-fed larva spins a thin, transparent silken cocoon on the foliage of the host plant on which it has developed. The adults may be recognised by the small silvery markings on their forewings. At times the caterpillars injure the leaves of commercial bean crops but they are mainly a pest in home gardens.

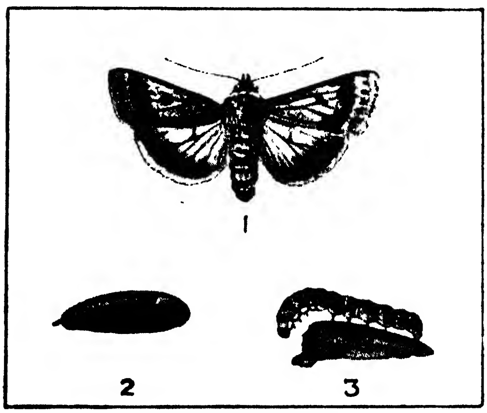


Larva, Cocoon, and Adult of a Pseudo-looper

The Tomato Moth.

(*Heliothis armigera.*)

The caterpillars of this well-known pest of tomatoes have a wide range of host plants, including beans, and although present in most districts each year, only occasionally cause serious crop loss.



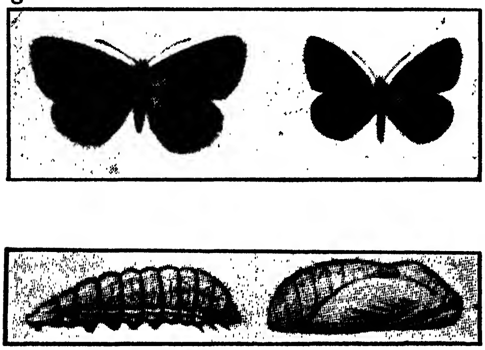
1.—Adult of Tomato Moth.
2.—Pupa. 3.—Caterpillar.

The fully-fed larva, which measures about 1¼ inches in length, is very variable in colour. It may be pale yellowish, green or even dark grey. The pupal stage is passed in the soil.

The Bean Butterfly.

(*Zizeeria labradus.*)

The larvae or caterpillars of this small "blue" butterfly sometimes cause damage to beans by eating the flowers, or chewing holes in the pods. They also feed on various other legumes.



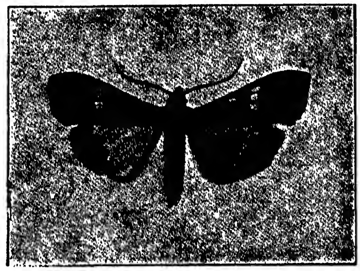
The Bean Butterfly.
Top left: Female. *Top right:* Male.
Bottom left: Caterpillar (enlarged).
Bottom right: Pupa (enlarged).

The green colouration of the small larvae renders them almost invisible in the crop, but the adults, which measure less than an inch across their expanded wings, may be seen flitting about in the sunlight over the plants. The upper surface of the wings of the female is dull blue-grey with brighter iridescent blue near the body; in the male the wings are lilac blending into metallic brown.

The Bean Pod Borer.

(*Maruca testulalis.*)

This insect was recorded in 1939 as a pest of beans reaching the Sydney market from the north of New South Wales, but it does not appear to have been noted since then.



Moth of Bean Pod Borer.

The damage is caused by the larva, which tunnels into the bean pod and feeds on the seeds; the cavity becomes filled with excrement and the bean rots. The adult is a small moth which measures slightly more than an inch across the expanded wings.

Control of Caterpillars.

For the control of the different caterpillars that attack beans, either spray or dust with D.D.T.

The spray :

D.D.T. emulsion (20 per cent.)	3 fluid oz.
Water	4 gallons.

The dust:

2 per cent. D.D.T. powder.

Crops should be treated at the early podding stage, preferably, and where this is not possible and crops are in production, they should be picked over heavily before treating, to avoid the risk of undesirable spray residues occurring on the pods.

The Friday Pack.—New Type U.S.A. Fruit Case.

SAMPLES of a new type of fruit case now in use in the United States have been received by the Division of Horticulture. Known as the Friday Pack (after its inventor, Mr. Paul Friday) it consists of a light-weight collapsible wooden case, together with thick paper trays for holding the fruits in position.

The main advantages claimed are improved protection from bruising, ease of packing, rapid cooling in cool store and light weight. The inventor is interested in the possibility of manufacture in Australia and is keen to receive comments on its applicability to conditions in this country.

Observations and tests on the samples received are to be made under local conditions by the Division of Horticulture.

POLL STRIKE IN RAMS.

B.H.C. as a Preventive.

Further Trials at Nyngan and Trangie.

G. J. SHANAHAN, B.Sc.Agr., Assistant Entomologist, and
F. H. W. MORLEY, B.V.Sc., H.D.A., Veterinary Officer.

A HIGH incidence of poll strike is common in Merino rams unless special precautions are taken to prevent strike. These measures include removal of wool from around the horns, shearing twice yearly and treatment of the polls with various dressings, which usually contain boracic acid or arsenic.

Until the value of B.H.C. as a poll strike preventive was demonstrated in the trials at Blandford and Trangie, no promising means of protecting Merino rams from head strike were available[1]. The results from the preliminary work with this chemical are now supported by further trials at Nyngan and Trangie. A number of strikes occurred on rams' heads in the investigations, but the differences between the numbers of strikes in the treated and untreated rams are significant* in each experiment.

Four experiments with B.H.C., as a poll strike preventive, are described in this report. Two B.H.C. dispersions were used at 1.0 per cent. concentration. In addition, rams were treated with 0.75 and 1.0 per cent. B.H.C. emulsion. An unusually severe "fly wave" was experienced during the experiments, especially during late October and early November, 1947. The table of results summarises the trial and includes the per cent. of poll strikes in both treated and untreated rams, which were grazed together in each experiment.

Experiment 1: Trangie Experiment Farm.

On 15th September the polls of 87 rams, August shorn, were jetted with an experimental line of B.H.C. dispersible powder (dispersion A) at 1.0 per cent. using a power-jetting plant at a pressure of 30 to 40 lb. per square inch. The dispersion was applied with a two-jet nozzle at rate of 3.6 pints per ram and the wool on the poll was completely wetted. A control group of 86 rams was left untreated.

* The χ^2 values for experiments 1, 2, 3 and 4 are 23·3, 40·2, 17·4 and 91·7 respectively ($P < 0·01$).

POLL STRIKE INCIDENCES IN RAMS.

Experiment.	Treatments.	Duration of Trial.	No. of Sheep.	Per cent. Poll Strike.
1	Untreated		86	40·7
Trangie	1·0 per cent. B.H.C. dispersion A	56 days	87	8·5
2	Untreated		64	37·5
Trangie	1·0 per cent. B.H.C. dispersion B	*26 days	98	0
3	Untreated		80	42·5
Trangie	0·75 per cent. B.H.C. emulsion ...	56 days	87	12·6
4	Untreated		66	93·9
Nyngan	1·0 per cent. B.H.C. emulsion ...	56 days	66	7·6

* Trial terminated after 26 days.

NOTE.—B.H.C. with 13 per cent. gamma isomer content.

Experiment 2: S. Austin, Wambiana, Trangie.

A hand-jetting plant was used to jet the polls of 98 rams, which had been shorn about six months previously, with 1.0 per cent. dispersion of B.H.C. (proprietary line dispersion B). The sheep were treated at the rate of four rams per gallon on 30th October. The control group comprised 64 rams.

Experiment 3: Trangie Experiment Farm.

A group of 87 rams, August shorn, was jetted on the poll with 0.75 per cent. B.H.C. on 25th September at the rate of 8 rams per gallon. The power-jetting plant was used and the jetting was conducted with a variable pressure not less than 40 lb. per square inch. This experiment was designed to economise on both materials and time of operation. The jetting nozzle was thrust into the wool behind each horn and given two momentary squirts. The amount of wool receiving treatment was limited. A mob of 80 control rams was maintained. A. B.H.C.-xylol emulsion concentrate, made in the laboratory, was used in this experiment.

Experiment 4: Canonba Station, Nyngan.

The polls of 66 rams, shorn five months previously, were jetted on 18th September with 1.0 per cent. B.H.C., again laboratory-prepared, and run with an equal number of untreated rams. The rams were treated with a stirrup pump at the rate of 4 rams per gallon.

Discussion.

It will be seen in the table of results that B.H.C. dispersion and emulsion at 1.0 per cent. gave a significant decrease in the incidence of poll strikes for eight weeks. In Experiment 2 in which 1.0 per cent. B.H.C. dispersion was used, no head strikes were obtained for 26 days, after which the trial was concluded. At Nyngan, where 93.9 per cent. strike occurred in untreated rams, 7.6 per cent. strikes were recorded in rams which had been treated with 1.0 per cent. B.H.C. With reference to Experiment 3, in which an attempt was made to simplify the treatment and thereby increase speed of operation, it is indicated that the wool on the poll area was insufficiently wetted, as 12.6 per cent. strikes occurred in the treated group.

Further work is required to decide both the concentration of, and the form in which B.H.C. is most effective as a poll strike preventive. However, sheep owners could protect their rams from head strike with 1.0 per cent. B.H.C. as either a dispersion or emulsion for eight weeks, at the rate of not less than four rams per gallon. In treating the polls particular care should be taken to ensure that the wool immediately behind the horns is well saturated, as this region is specially attractive to blowflies.

It has been reported previously that mild to severe head strike in rams had been effectively treated with 1.0 per cent. B.H.C. emulsion without removal of the wool[2]. Extreme care was taken to ensure that all "pockets" of maggots were treated with the dressing. If it seems necessary to shear away wool to trace the maggot "leads," then as much wool as possible should be left to retain the B.H.C. and thus prevent restrike.

It is understood that limited supplies of proprietary lines of B.H.C. suitable for use as preventives of poll strike in rams, are now available.

Acknowledgments.

We are indebted to Canonba Station, Nyngan, especially to Mr. Ramage, Manager of the Station, and to Mr. S. Austin, Wambiana, Trangie, for their assistance in the work. We are also grateful to Mr. D. O'Neill (Chemist) and Mr. F. McCleery (Biometrician) of the Department, for the preparation of the B.H.C. concentrate and statistical analysis of the results respectively.

(1) Shanahan, G. J.—N.S.W. Agricultural Gazette (1947), vol. 58: 333.

(2) Shanahan, G. J., and Morley, F. H. W. (1947), vol. 58: 660.

Two hives of bees are to be forwarded from Hawkesbury Agricultural College apiary to Saigon, Indo-China.

The Australian Trade Commissioner in Singapore and the Commonwealth Department of Commerce and Agriculture are interested in this project. Apart from three small colonies forwarded last year from the College, which survived the long air trip, there are no honey bees in Indo-China. It is thought, however, that the additional hives to be forwarded will ensure of a good establishment in that country.—W. A. GOODACRE, Special Livestock Officer (Bees).

APIARY NOTES

DEVELOPMENT OF AMERICAN FOUL BROOD.

W. A. GOODACRE, Special Livestock Officer (Apiculture).

OBSERVATIONS of considerable interest in connection with the development of American Foul Brood (*Bacillus larvae*) were made recently by the Department. An occasion had arisen where it was necessary to make a practical test of honey which had presumably been mixed with infected brood comb. In the first place, the Department's Biologist, by centrifuging a sample of the honey and then carrying out a microscopical examination, reported that spores similar to "A.F.B." disease were present.

However, to make a definite diagnosis, one teaspoonful of the infected honey was fed to a strong three-frame nucleus colony which had been isolated for the purpose. Little food had been stored in the hive, and the nurse bees eagerly took up the honey, which was poured in a thin stream along a couple of the frame top-bars. Incidentally, it was rather distressing to see them consuming the honey, which, at the time, we felt rather sure had been baited with "A.F.B." and would later be turned into brood food and fed to young bee larvae, where the disease would develop.

Results from Feeding Infected Honey.

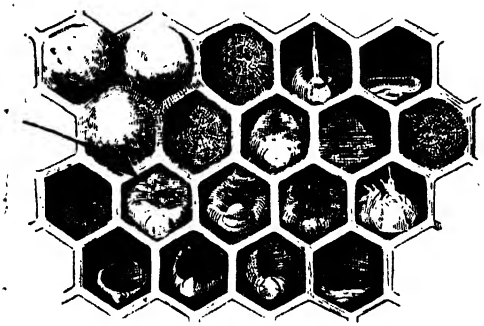
The motive in feeding only one teaspoonful of the baited honey was to test the infective nature of such a small quantity. The bees were fed this quantity on 12th February, 1948, and a close watch was kept for symptoms of the "A.F.B." disease to develop. On 24th February, although no outward signs of disease could be detected, a small patch of cappings over the brood was removed, disclosing the presence of two dead larvae. These were stretched out along the lower walls of their brood cells, and that pearly lustre associated with healthy larvae at this age was not present. In addition to the change in colour to a dull grey, their bodies had slumped in the centre. The condition was similar to the larvae indicated by arrow in the accompanying illustration.

Quick Development under Certain Conditions.

Bacillus larvae exists in two forms (together with the transition stages one to the other). These are the spore form, and the rod-shaped or vegetative form. The spores first germinate and form chains of rods,

which grow and multiply till the food supply deteriorates, then revert to spores.

On examination of the two larvae, the Departmental Biologist submitted the following report:—



American Foul Brood.

No. 1.—Large numbers of *Bacillus larvae* rods with occasional spores were found in this larva.

No. 2.—Large numbers of spores of *Bacillus larvae* were found in this specimen.

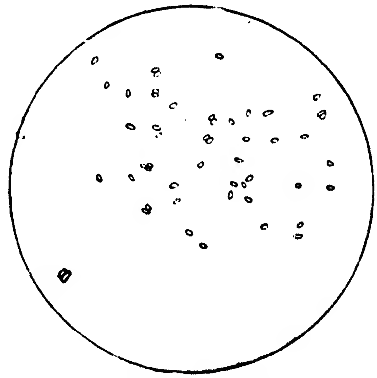
It will thus be seen that the spore-laden honey must have been fed to the experimental larvae very soon after being placed in the hive, since spores were already commencing to recur in larva No. 1. No. 2, in which all rod forms had reverted to spores was in a more advanced stage of infection than No. 1.

A further examination of the infected nucleus hive on 28th February revealed that the larvae dead of the disease were becoming discoloured, and showed ropiness characteristic of "A.F.B." There was also some tendency towards formation of scales (the dead larvae drying up on the lower part of their brood cells). At this stage, sixteen days from the time the baited honey had been fed, field symptoms were sufficiently advanced to allow detection of the disease. A further examination on 8th March revealed extensive infection with all field symptoms well developed, and on completion of this inspection the colony was fumigated and all dead bees and other material burned.

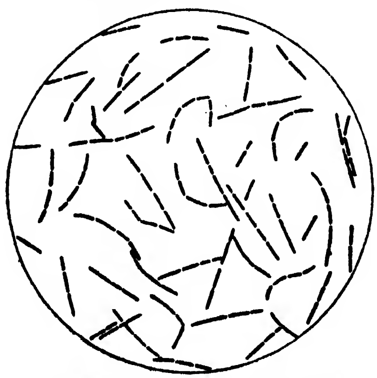
These tests revealed that the baited honey had been most virulent in its action, and having been fed to bees at a time when little, if any, supplies were coming in from natural field sources, the full development of "A.F.B." disease proved more rapid than is usually believed to be the case.

Infectious Nature of Baited Honey.

Such feeding of baited honey would be more likely to result in an infection than the usual means by which the disease is spread; bees robbing from an infected hive, or gaining access to extracted honey produced from an apiary where a number of hives might have been infected. The reason for this is that much of the honey in diseased hives may have been stored direct from the fields, and would not contain such a large number of spores; also that honey



Spores of American Foul Brood.



Vegetative Rod Form of *Bacillus larvae*.

which has been extracted from a number of hives, only odd ones of which may have been diseased, would not have such a high spore content.

Whilst it is conceded that these two common causes of infection do constitute a serious factor in the spread of the disease, it is often found that honey and brood combs interchanged from infected hives to

clean ones by the bee-farmer (before he realises the disease is present) cause further and more serious spread of this brood disease in the apiary. In all cases where brood disease has been spread throughout an apiary in the usual way, as referred to above, it is found in various stages of development, *i.e.,* some colonies more advanced than others.

Apiaries Maliciously Infected?

In a recent case, officers of the Department inspected two apiaries, and found 129 hives out of 130 infected with "A.F.B.", the disease being at the same early stage of development throughout the apiary. All features of the outbreak indicated that the hives had been maliciously baited with highly infectious material—perhaps similar to the experimental sample fed to the colony by the Department, as mentioned earlier.

The two infected apiaries were about two miles apart; a close inspection during the previous month had failed to locate the presence of any disease, or even a possible source from which such general infection could have been spread, nor could any such source of infection be located at the time the disease was found.

Actually, the baited honey with which the practical test was carried out was found on an apiary in the same district. Hence the necessity for the practical test and observations, which proved very enlightening as to the development of the disease.

Bees at the Royal Show.

Comments were made by the press recently, concerning bees being kept for a lengthy period in observation hives at the Royal Show, and the obvious distress which occurs.

Actually, ten days is too long for bees to be kept in single-frame observation hives without either reconditioning or an opportunity of cleansing flight. Under natural conditions, however, bees can be kept for much longer periods in a hive where they are not disturbed by light, which induces excessive activity. This is instanced by the fact that, in the early days, hives of bees were shipped from European countries to Australia in sailing boats.

In single-frame observation hives, the light and the unnatural conditions which cause excessive activity (and therefore a corresponding increase in consumption of stores) make it necessary for bees to be allowed cleansing flights at least once every four to five days if they are to be kept in good condition. White combs in observation hives, which further increase light reflection, do not appear to be as suitable as dark brood combs.

Banana Grading.

New Regulations in Force in Western Australia.

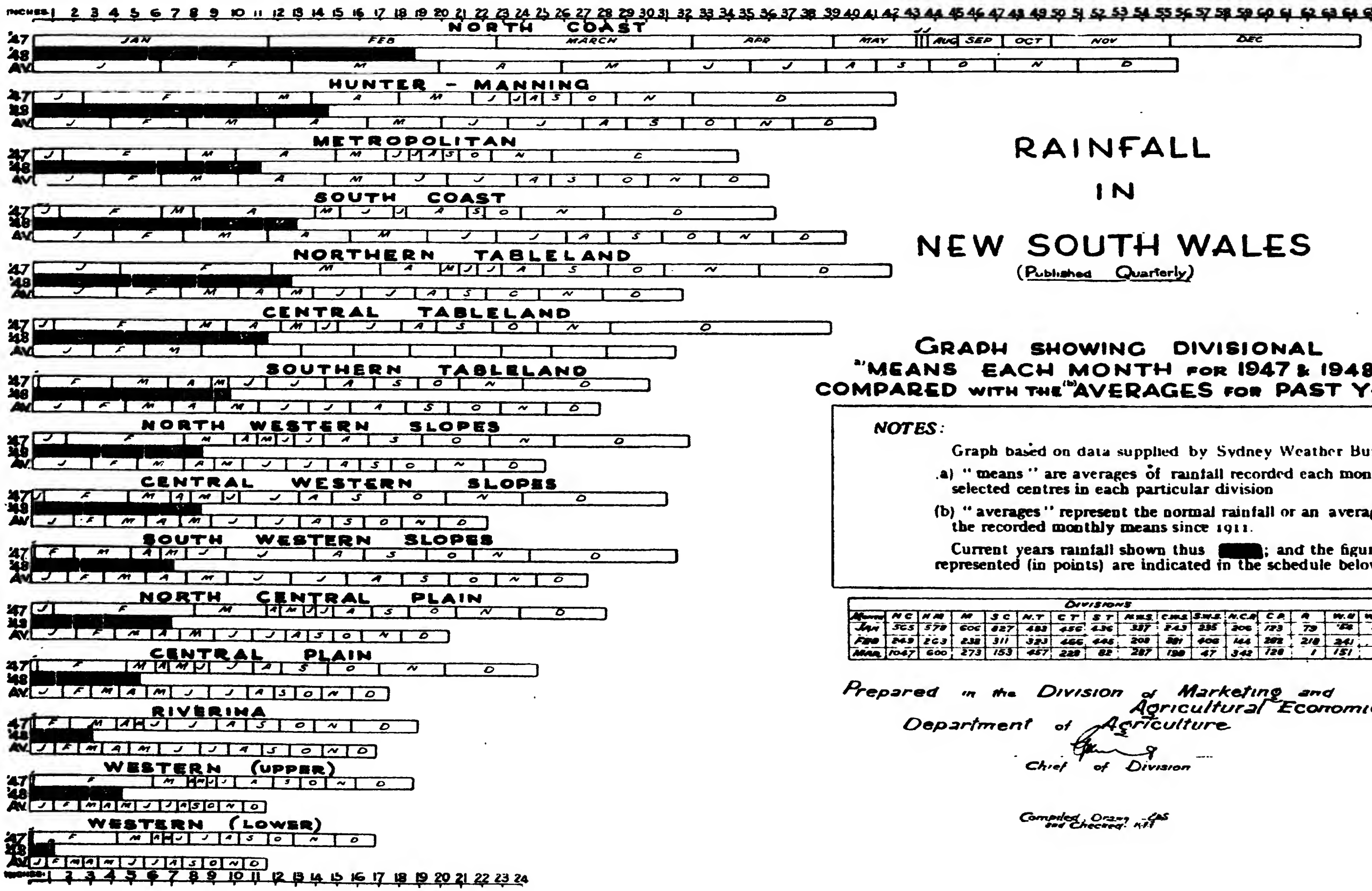
BANANA grading regulations have been gazetted recently in Western Australia. In the interests of New South Wales banana growers, the Department of Agriculture has obtained details of the regulations, the immediate effects of which are as follows:—

There are five grades: namely, "Small," "Sixes," "Sevens," "Eights" and "Nines." The lengths of the bananas for these grades are the same as in this State, and measurement is made similarly around the outside curve of the fruit. No girth measurements of the fruit are prescribed for the respective grades, so that very thin fruit can be forwarded, so long as it complies with the length measurement.

It is also provided in the regulations that each external layer of bananas on the top, sides and bottom of the case shall be a true indication of the grade of the bananas in the case.

Regulations have also been gazetted to guard against introduction of bananas infected with "Squirter" disease into Western Australia. No bananas will now be admitted into that State, from May to September, inclusive, in any year, unless they have been "Shirlan" treated on the plantation on which they were grown, in accordance with the standard recommendation for control of "Squirter" disease adopted in this State.

All cases packed with bananas so treated are required to be stencilled on one end, "Shirlan treated"; or "Shirlan dipped." Each consignment of such bananas must be accompanied by a statutory declaration signed by the consignor or grower to the effect that the fruit has been treated and the cases stencilled as abovementioned. Such declaration shall be produced by the consignee or his agent on demand by an Inspector of the Department of Agriculture, Western Australia.



RAINFALL IN NEW SOUTH WALES

(Published Quarterly)

GRAPH SHOWING DIVISIONAL (a)"MEANS EACH MONTH FOR 1947 & 1948 COMPARED WITH THE (b)AVERAGES FOR PAST YEARS

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division

(b) "averages" represent the normal rainfall or an average of the recorded monthly means since 1911.

Current years rainfall shown thus ; and the figures so represented (in points) are indicated in the schedule below:

	DIVISIONS														
Month	N C	H M	M	S C	N.T	C T	S T	N.W.S.	C.W.S.	S.W.S.	N.C.P.	C P.	R	W.U	W.L.
Jan	565	579	606	827	482	456	436	337	243	235	206	123	79	56	32
Feb	249	263	238	311	323	466	446	208	381	406	144	282	218	241	75
Mar.	1047	600	273	153	457	228	82	287	198	47	342	128	1	151	4

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

Chief of Division

Compiled, Drawn and Checked

Selecting Dairy Cows.

Useful Points in Outward Appearances.

A. C. SMALL, H.D.D., Principal Dairy Officer.

MANY dairymen who do not keep records of their cows are obliged to rely on outward appearance when selecting new stock.

The points which should be given most thought when purchasing new stock are those that indicate:

1. The capacity of a cow to walk and gather food.
2. Capacity to digest food eaten.
3. Capacity to carry a large udder without discomfort.

Capacity to Walk and Gather Food.

Capacity to gather food is governed first by a cow's ability to walk. She should be free of any foot or leg weaknesses. Chief of these weaknesses are:

1. "Splaw" footedness; *i.e.*, excessive spread of the cloven hoof; and
2. "Cow" hocks, *i.e.*, the hocks close together and pointing inwards instead of slightly outwards, and hind legs sloping forward, throwing the body weight on the tender part of the rear of the hoof.

Capacity of a cow to gather food is also governed by formation of the muzzle and jaw. The muzzle should be broad. The bottom jaw should be broad and so formed that it sets squarely on the top jaw. A cow with a bottom jaw that slopes gradually is termed "pig" jawed, and this defect prevents her gathering her food supply with the necessary degree of speed.

Points Indicating Strong Digestive Capacity.

The main indication of this capacity is a strong, well-formed barrel showing plenty of depth. The ribs should be well-sprung and widely separated.

A cow's digestive capacity is also indicated by general appearance of health, such as alertness and activity, a full bright eye, a moist muzzle, ears elevated and only slightly receding, and a clean, healthy coat.

Capacity to Carry Large Udder Without Discomfort.

One of the main points indicating this capacity in a cow is length from hip bone to pin bone. The front of a cow's udder practically always ends at a line drawn perpendicularly from hip to ground. Therefore, the farther forward the hip joint the greater the length of the udder.

Width of udder is governed by width of the cow's body in the udder region. A cow should be wide across the hips, and, to ensure uniformity of width, the pin bones should similarly be widely separated. When these bones are set closely together, and the angle of a line drawn from hip to pin bones is accentuated, it usually means that the hind legs are close together with the hocks turning slightly inward, leaving restricted space for udder development.

For a cow to be able to develop her yield to a maximum capacity the hocks should be widely separated and should point outwards slightly, so leaving plenty of space for the attachment of the udder. When the hocks are close together and pointing inwards, pressure is exerted on the udder when it is fully extended with milk. This pressure causes soreness and leads to early diminution in milk flow.

Flat thighs and freedom from flesh in the area surrounding the escutcheon are qualities essential to milk production. Round thighs, and heavily fleshed hindquarters, especially that part below the pin bones, indicate that a cow is utilising her food principally for the development of meat, and that there is limited space for inclusion of

(*Continued on page 270.*)

CHORIOPTIC MANGE IN CATTLE.

CONTRIBUTED BY VETERINARY BRANCH, DIVISION OF ANIMAL INDUSTRY.

THE recent occurrence of *Chorioptes bovis* in a stud herd, and its probable widespread incidence throughout the State, suggest that the following description of the condition will be of interest to stockowners.

On the stud property concerned, the use of lime-sulphur solution (1 per cent. polysulphide content) gave satisfactory control.

Chorioptic Mange is a mild, infrequent form of mange caused by the mite *Chorioptes bovis*. It lives on the surface of the skin, and its activity is usually limited to a small area.

The most frequent starting point for this disease is the area comprising the root of the tail and the grooves on either side. In the initial stage, the skin may look as though overlaid with varnish, but soon becomes covered with fine, dry scales. Moderate itching is present. In other cases the disease attacks the feet, causing an eczematous condition of the fetlock region. In neglected cases it may spread to the croup, sacral region and back, perineum and inner sides of the thighs, and occasionally to the scrotum or the udder.

Apart from these severe cases, which are rare, and in which the general condition becomes affected, the disease is of benign character and may persist for years without causing any particular trouble, though it tends to become aggravated in cold weather. It is only slightly contagious.

Diagonsis.

This is made by microscopic examination of scrapings from recently affected areas, when the mites are readily seen.

Differential diagnosis between the various forms of mange depends upon the distribution of the lesions and examination of the mites. Sucking and biting lice cause itching and superficial eczema, but are easily detected with the naked eye. They may, on the other hand, occur in conjunction with mange. Idiopathic pruritis is distinguished from mange by the acute onset and the distribution of the itching (over large areas of surface), and by the negative results of microscopic examination. In eczema, inflammatory changes are conspicuous, the skin does not become dry and hard, scratching with the finger causes little or no itching, but the skin is tender to the touch and often shows a raw, weeping surface. Ringworm is characterised by the circular shape of the bald areas and the rounded grey or yellowish crusts.

Treatment.

The hair is clipped from the lesion and its surroundings, and the affected area scrubbed thoroughly with hot soap and water. Lime sulphur solution containing 1 per cent. polysulphides at blood temperature is then scrubbed or sprayed on to the affected area. Treatment is repeated three times a week.

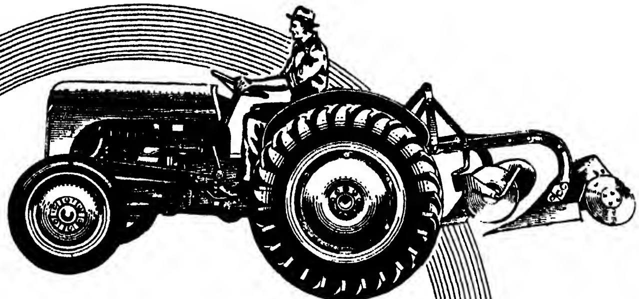
Selecting Dairy Cows—*continued from page* 269.

milk-secreting organs. In addition to being small, the udder of such a cow is of heavier flesh, and has less capacity to extract from the blood the fluid which is subsequently converted to milk.

A cow's udder should be broad and long with a comparatively flat sole, and extending well up in the rear. The attachment at the rear should be from a gradually sloping udder when in full milk. An abrupt termination of the udder, both in front and rear, is a decided defect; in such cases the udder usually hangs low, hinders the cow in her efforts to gather food and more effort is required to withdraw the milk.

The skin of a cow's udder should be soft and silky.

The flank of a cow should be low, because the flank is nature's protective curtain for the udder. The udder should be attached to the abdominal wall, well up from the bottom of the flank.



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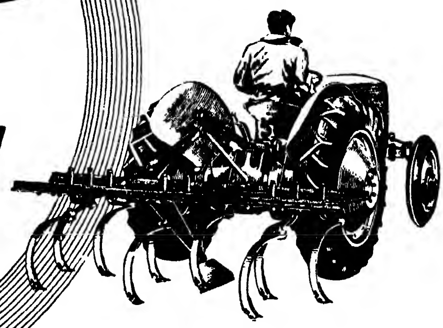

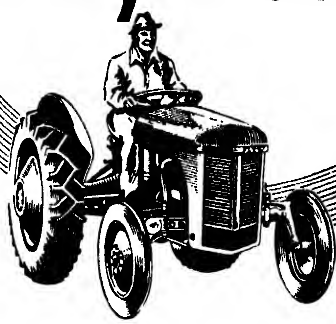

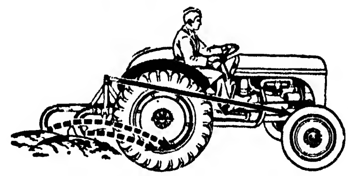

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THE FERGUSON SYSTEM

SHEEP BLOWFLY CONTROL

JETTING WITH B.H.C.

Experiments at Trangie and Bellata.

G. J. SHANAHAN, B.Sc.Agr. and F. H. W. MORLEY, B.V.Sc., H.D.A.

DURING severe fly waves, such as were experienced in many districts throughout the State in the spring and early summer of 1947, constant handling of ewes (in some instances those treated by the Mules and tail operation*) is required, unless additional protection against breech and tail strike is afforded by either jetting or crutching or both. Since crutching cannot always be hastily arranged graziers may find it advantageous to jet even "mules-ed" ewes whenever a very severe fly wave occurs.

The writers desire to emphasise that it has been amply shown that the modified Mules operation and tail operation will practically eliminate crutch and tail strike in merino ewes in most years. Futhermore, it is stressed that anyone considering adopting jetting as a fly control measure should firstly employ the Mules operation thoroughly. Local experience will then indicate whether jetting, under severe fly wave conditions, in addition, is required.

The great value of jetting for control of breech strike is known. Ewes can be managed during a severe fly wave by jetting with arsenical mixtures, preferably calcium arsenite, with a minimum of hand dressing. However, despite the undoubted utility of arsenicals for this purpose there seems to be a need for a readily miscible and less dangerous jetting mixture.

In an attempt to develop an alternative jetting mixture the writers have conducted field experiments with B.H.C. with which the pioneer work for sheep blowfly control was carried out by Harbour and Watt

* In the 1947 spring and summer fly waves Morley observed 20 per cent. breech and tail strike in ewes which were efficiently treated by the modified Mules operation. He also recorded 11 per cent. breech and tail strike in ewes similarly treated, but upon which the tail operation as described by Graham and Johnstone, 1947, had been performed as well.

(1945). Whilst these workers, and later, Hughes *et al* (1947), found that B.H.C. was not very promising for prevention of blowfly strike, mainly body strike, our experiments indicate that this insecticide will give a degree of protection against breech strike similar to that given by calcium arsenite.

Our first experiment with B.H.C. against breech strike was commenced in autumn of 1946, but as a low incidence of strike was recorded the results from the trial had little value. The work was continued during the autumn of 1947 when experiments were carried out at Trangie and Bellata.

It is always desirable to have an untreated control group in experiments where an insecticide is under test; however, it is not infrequent custom in experimental procedure to include a standard recommendation for observation as a control group. This plan was adopted with our experiments in which calcium arsenite was tested against B.H.C. emulsion at 0.3 per cent. and 0.5 per cent. concentrations.

The B.H.C. (benzene hexachloride) emulsion concentrate was prepared by dissolving the insecticide in xylol and adding a suitable emulsifier. The crude chemical, from which the concentrate was made, contained 13 per cent. gamma isomer.

The Experiments.

Experiments 1 and 2 were commenced at Trangie Experiment Farm and Jew's Lagoon Station, Bellata, with 679 ewes of mixed ages and 1,090 maiden ewes, on the 14th and 21st April, 1947, respectively. The ewes in each experiment were breech classified and arranged into three groups, containing approximately equal numbers of class A, B and C type sheep, which were jetted about five weeks from crutching with 0.3 per cent. and 0.5 per cent. B.H.C. emulsion, and calcium arsenite at 1.0 per cent. concentration. The sheep in both experiments were grazed together. The number of sheep per treatment group is shown in the table of results.

Results.

The percentage strikes, at intervals in days from jetting in experiments 1 and 2 until the 35th and 31st day respectively, for the two B.H.C. treatments and the calcium arsenite treatment are given in the table. No figures are available for the percentage strike in the various groups for experiment No. 2, 35 days from treatment.

TABLE OF RESULTS.

(a) *Experiment 1. Trangie Experiment Farm.*

Treatment.	No. of Sheep per Treatment	Percentage Strike, Progressive Total.					
Days from treatment	......	23	28	29	31	32	35
Calcium arsenite ...	227	2·7	2·7	3·9	6·2	7·5	8·8
0·3 per cent. B.H.C.	224	0·5	0·9	1·0	1·8	4·5	5·4
0·5 per cent. B.H.C.	228	1·8	3·1	3·1	3·9	4·8	7·9

(b) *Experiment 2. Jew's Lagoon Station, Bellata.*

Treatment.	No. of Sheep per Treatment	Percentage Strike, Progressive Total.			
Days from treatment	......	13	19	23	26	31
Calcium arsenite ...	366	0·3	1·9	2·7	3·8	4·9
0·3 per cent. B.H.C.	366	2·4	4·9	5·7	6·8	8·5
0·5 per cent. B.H.C.	358	1·7	2·8	3·6	4·2	5·6

It will be seen from the table of results that there were consistently less strikes in experiment 1 throughout the recorded period in the two B.H.C. groups than in the control group. At the end of five weeks, the time for which calcium arsenite is effective, the percentage of strikes in the calcium arsenite and 0.3 per cent. and 0.5 per cent. B.H.C. groups were 8.8 per cent., 5.4 per cent. and 7.9 per cent, respectively. The differences are statistically non-significant ($\chi^2 = 2{\cdot}11$ P $< 0{\cdot}5 > 0.3$).

With reference to experiment 2, the calcium arsenite treatment was somewhat better than the B.H.C. treatments for the 31 days of the trial. As stated previously, figures are not available for the 35th day. At 31 days from jetting the percentage strikes were 4.9 per cent., 8.5 per cent. and 5.6 per cent. in the calcium arsenite, and 0.3 per cent. and 0.5 per cent. B.H.C. groups, respectively. The differences are again statistically non-significant ($\chi^2 = 4{\cdot}39$ P$<{\cdot}2>$ $0{\cdot}1$).

Since the differences in the incidence of strikes between the B.H.C. and calcium arsenite groups for each experiment are statistically non-significant, no conclusion can be drawn from the results on a statistical basis alone. However, a consideration

of the experience of McCulloch (1936), with calcium arsenite as a jetting agent, and the results from our experiments with B.H.C. and calcium arsenite, will show that the new insecticide under test is promising for prevention of breech strike.

McCulloch (1936) found that approximately 5.5 per cent. of jetted sheep, as compared with 68 per cent. untreated ones were considered to require handling in an experiment at Trangie Experiment Farm with two equal groups of 255 jetted and unjetted ewes within five weeks from jetting.

Whilst an untreated group was not kept in our experiments it is felt that not less than 50 per cent. strike would have occurred, as 8.8 per cent. and 4.9 per cent. strikes were recorded in experiments 1 and 2, 35 and 31 days from treatment.

As there are small differences in the percentage strikes between the two B.H.C. groups and the calcium arsenite group for each experiment the results indicate, firstly, that B.H.C. emulsion at 0.3 per cent. and 0.5 per cent. gave a marked decrease in the incidence of breech strike, and secondly, that this insecticide compares favourably with calcium arsenite as a jetting mixture for blowfly control.

B.H.C. Confines the Strikes.

When sheep are jetted with calcium arsenite it is seldom necessary to hand-dress any strikes which develop during the five weeks following jetting. Sufficient arsenic remains in the wool to retard normal development of the strikes.

It was noticed that strikes on ewes in the B.H.C. groups were also confined and serious breech strikes were rare.

Effect on Sheep.

The ewes in these trials were jetted with 0.3 per cent. and 0.5 per cent. B.H.C.-xylol emulsion without any apparent adverse effect.

Ewes with small to extensive strikes have also been jetted at these strengths of B.H.C. and were unaffected by the treatment. If a "struck" sheep is well jetted with this insecticide at either concentration the maggots usually leave the strike within 30 minutes.

Conclusions.

B.H.C.-xylol emulsion at 0.3 per cent. and 0.5 per cent. in two jetting experiments gave a degree of protection from breech strike similar to that given by calcium arsenite, in both prevention and spread of strikes.

Acknowledgments.

We desire to thank Mr. S. Fletcher, of Jew's Lagoon Station, Bellata; Mr. J. Hockley, Livestock Officer (Sheep and Wool), Tamworth; and Mr. W. E. Crogan, Stock Inspector, Narrabri, for their assistance in the work. We also thank Messrs. D. O'Neill and F. C. McCleery of the Department for chemical and biometrical advice respectively.

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Water is a Frequent Cause of Cream Contamination.

FAULTS in milk and cream can frequently be traced to stagnant water. While the popular belief that cows drinking such water is, in itself, the cause of subsequent deterioration is unfounded, the fact remains that bacteria from such water often gain indirect entry to the milk. Mostly the cattle wade in a polluted swamp searching for water-couch, or they may even have to cross a stagnant creek in being driven to the milking yards. The body, including teats and udder, is fouled in this manner and the bacteria are later added to the milk while it is being drawn.

The biological quality of the water used for washing down the udder is also of importance. When cow after cow is washed with the same cloth and water from the same pail the water becomes more and more insanitary and a source of pollution to the milk. Sometimes the water is unsuitable at the outset, being taken from iron tanks in which manurial dust, blown from the yard to the roof and washed down the spouting, has been allowed to accumulate for months. —DIVISION OF DAIRYING.

OATS FOR POULTRY.

Excellent Alternative to Wheat.

POULTRY farmers will find it necessary to use more oats in their flock rations this year, owing to the urgent call on Australian wheat for export to Great Britain and other needy countries.

Making this prediction recently, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said the oat crop last season had been a record one, and according to reports by cereal authorities the quality of the grain, generally, was excellent.

"In comparison with weather-damaged wheat, much of which is now being supplied for stock food," said the Minister, "the quality of oat grain available for feed purposes, if anything, should be superior."

Feed Good Quality Oats.

Mr. Graham went on to say that the main essentials in feeding oats to poultry were to ensure a regular supply, to ensure that that supply was of good quality oats, and that the cost was comparable to that of wheat on a weight basis allowinv for waste in excess fibre.

Continuity of supply was important for the reason that poultry could not be switched suddenly from one feed to another without a drop in egg production.

Good quality was necessary to avoid the excessive fibre content of poor quality oats, which made the supplementation of some protein-rich concentrate necessary.

Watch Feed Costs.

Comparable cost was important in that three bushels of oats were equivalent to only two bushels of wheat on a feed basis; and oats, therefore, ought not to cost more than two-thirds the price of wheat.

The price of feed oats from the Barley Board was fixed at 4s. 3d. per bushel; on a feed value basis with wheat at 6s. 3d. per bushel, therefore, this price was comparable.

Change to Oats Gradually.

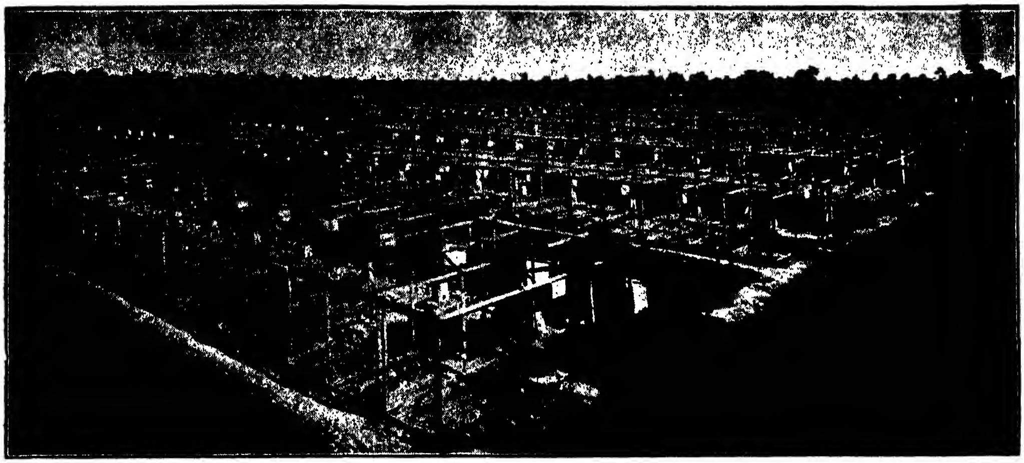
It might take as long as three weeks to induce poultry to eat the full quantity of oats essential to maintain production, the Minister pointed out.

The best course during this time was to feed the oats before allowing the birds their wheat; but when they had become used to eating the oats, a mixture of wheat and oats could be fed at the one time.

DUTCH housewives save about 18 million guilders per year for their country, by saving potato peelings and other vegetable waste which is collected and processed into fodder for dairy cows, according to a recent statement received from the Netherlands Information Bureau.

The scraps are placed in baskets and collected in all municipalities by some 1,500 licensed collectors. The refuse is then cleaned, steamed and made fit for consumption by dairy cows.

Last year 200,000 tons were collected in this manner, providing an extra 100,000 tons of milk—enough to supply the population of the second largest town in Holland, Rotterdam, all the year round.



Competition Pens at Hawkesbury Agricultural College.

Poultry Notes.

May, 1948.

E. HADLINGTON, Poultry Expert.

Comments on the 1947-48 Egg-laying Competition at Hawkesbury Agricultural College.

A slight improvement upon last year in the general average production for all breeds was shown in the test just concluded. The production per hen rose from 204.4 during last year to 205.9 during the 1947-48 competition.

Breed Averages.

Australorps, with an average of 209.5 eggs per hen, laid the highest average number of eggs during the competition. White Leghorns followed with 207.65; Langshans averaged 204.0; Anconas 191.6 and Rhode Island Reds 180.6.

Full Report of Egg-laying Competition.

FULL details of the 1947-48 Hawkesbury Agricultural College Egg-laying Competition are available in leaflet form and will be supplied on application to the Department of Agriculture, Box 36A, G.P.O., Sydney.

Mortality.

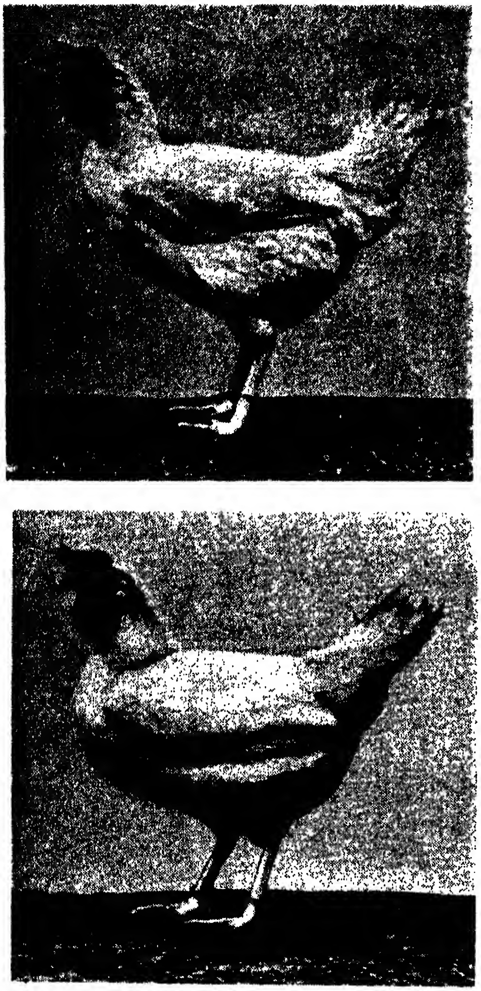
There was some improvement in mortality figures, the average for the whole competition being 5.4 per cent. compared with 8.3 per cent. last year. In addition 12 birds were killed by foxes.

This low mortality rate is a pleasing feature as it is below that of commercial flocks.

Egg Weights.

There were also less disqualifications for underweight eggs than in the previous competition, as shown hereunder:—

	Individuals.		Groups.	
	No.	Per cent.	No.	Per cent.
1947-48.				
Light breeds ..	17	5.6	6	12
Heavy breeds ..	10	4.2	4	10
1946-47.				
Light breeds ..	25	6.9	9	15
Heavy breeds ..	19	10.5	5	16



Two of Mr. R. Thoroughgood's Group of White Leghorns.
Winners of Grand Champion prize, highest group score in competition, and several other prizes.

Chief Prize Winners.

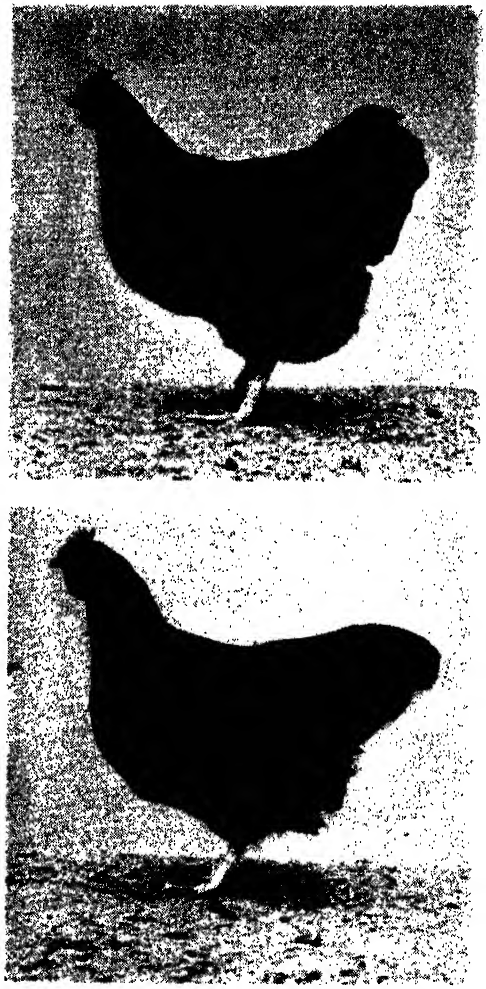
The A. A. Dunnicliff Grand Champion prize for the highest market value of eggs was won by the team of six birds owned by Mr. R. Thoroughgood, with a market value of £11 11s. 7½d.

The Golden Egg Trophy donated by the Metropolitan Meat Industry Commission for the group of six birds gaining the highest points for quality of birds and egg production, was won by Messrs. C A. Clark and Son.

The Grand Champion Consolation prize was won by Mr. S. Martin, whose pen of six birds laid eggs to the value of £11 3s. 9¼d.

The Golden Egg Consolation prize went to Mr. W. Knott, while the James Hadlington Memorial Medal awarded for weight and quality of birds and weight of eggs went to Mr. F. P. Finney, whose pen of Rhode Island Reds scored 114.5 points.

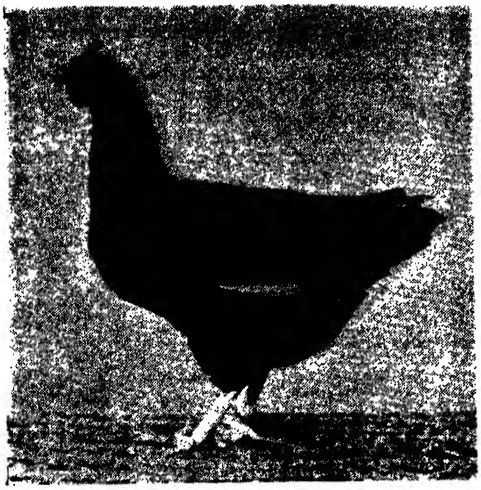
The highest group score in the competition was put up by White Leghorns, with a total of 1,512 eggs for the six birds owned by Mr. R. Thoroughgood; the highest group



Two of Messrs. C. A. Clark & Son's Group of Australorps.
This group won the Golden Egg Trophy, highest group score heavy breeds, and several other prizes.

score for heavy breeds was 1,485 eggs laid by Messrs. C. A. Clark and Son's pen of six Australorp hens.

The highest individual production was achieved by Messrs. C. A. Clark and Son's



Rhode Island Red of the Group entered by Mr. F. P. Finney.
This group won the James Hadlington Memorial Medal.

Return over Cost of Feed.

The gross return for eggs shows an increase of 6s. 8½d. per bird over last year, the figures being £1 12s. 2½d. this year as against £1 5s. 6d. per bird last year. The cost of feeding, based on ruling Sydney prices plus 6d. per bird to cover delivery charges, was 10s. 1d. per bird. This gives a return over feed costs of £1 2s. 1½d. per bird.

These figures, however, cannot be taken as applicable to commercial farms as the ration fed to the competion birds was composed mainly of mill offals, meat meal, wheat and maize, whereas most commercial farmers had to use more costly ingredients for the mash, thus increasing the cost of feeding to approximately 11s. 2d. per bird. Moreover, the average production on commercial farms is estimated at about 144 eggs compared with 205.9 in the competition.

One of Mr. W. Knotts' Group of White Leghorns.
Winners of the Golden Egg Consolation Trophy.

Wimbleford Poultry Farm's White Leghorn Hen which laid greatest number of Eggs in Light Breed Section

Australorp hen which laid 285 eggs, and the highest individual score in the light breeds was 284 eggs laid by Wimbleford Poultry Farm's White Leghorn hen.

Thus from ordinary farm flocks the average gross return per hen, after deducting marketing costs, would be approximately £1 0s. 10d. less cost of feed 11s. 2d., leaving 9s. 8d. per hen nett return. This compares with a return of 6s. 8d. over cost of feed last year.

IN one of a series of experiments, Mr. P. C. Hely, Entomologist, evolved a new formula for control of fruit fly. It consists of 2 fluid oz. nicotine sulphate, 2 fluid oz. D.D.T. emulsion (20 per cent.), 2½ lb. sugar and 4 gallons of water, and has been very effective on backyard fruit trees at Gosford and in a North Shore suburb of Sydney.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)	30
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188
Hawkesbury Agricultural College, Richmond (Jerseys)	106
Hicks Bros., "Meryla," Culcairn (A.I.S.)	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
McEachern, H., "Nundi," Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)	49
New England University College, Armidale (Jerseys)	25
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	35
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco (Jerseys)	89
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170
Von Nida, F. E., Wildes Meadow	30
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R., "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	42
Forster, T. L., and Sons, "Abington," Armidale	62
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	69
Salway, A. E., Cobargo (Stud Jerseys)	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.)	120	13/11/48
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	33	23/6/48
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	11/8/49
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.)	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	49	17/12/48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	110	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	777	27/1/50
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	74	2/2/49
Limond Bros., Morisset (Ayrshires)	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	74	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys)	94	27/10/48
Riverina Welfare Farm, Yanco (Jerseys)	91	11/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	101	16/2/49
Wagga Experiment Farm (Jerseys)	58	3/3/48
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords)	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	119	20/4/48
Yanco Agricultural High School, Yanco (Jerseys)	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle	19	14/4/48
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	209	12/8/48
Burns, R. "Wilga Glen," Coonamble	20	24/12/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell	32	11/8/48
Coventry Home, Armidale	11	29/9/48
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Forster, T.L., and Sons, "Abington," Armidale	62	24/5/48
Frizelle, W. J., Rosenstein Dairy, Inverell	111	9/9/48
Genge G. L., Euston, Armidale	46	22/9/48
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee" Braidwood	22	20/5/48
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	34	22/9/48
Johnson, A, "Rosedale," Grafton Road Armidale	34	22/9/48
Kenmore Mental Hospital	77	7/7/48
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	7	12/12/48
Lunacy Department, Morisset Mental Hospital	71	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	40	20/11/48
McMillan, N., Duval Road, Armidale	30	29/9/48
MacNamara, B., "Mount View," Cessnock	58	16/5/48
Marist Bros. College, Campbelltown	82	23/1/49
Mason, A., Killarney, Armidale	33	30/9/48
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Mullholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	115	27/8/49
Peat and Milson Islands Mental Hospital	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	12	29/12/48
St. John's Hostel, Armidale	6	24/6/49
St. Michael's Orphanage, Baulkham Hills	43	5/6/48
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boy's Home, Westmead	33	9/7/48
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree	53	10/2/48
Tanner, F. S., Dural Rd., Armidale	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale	33	30/9/48
Tombs, P. C., Kellys Plains, Armidale	49	29/9/48
Tombs, R., Harlwood, Armidale	40	22/9/48
Tosh, W. K., "Balgownie," Armidale	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number Tested.	Expiry Date.	Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*					
Von Frankenberg, F. E., "Spring Hills," Camden	68	12/12/48	Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Wallaga Lake Aboriginal Station	10	8/5/48	Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
Waters, A., Marsh Street, Armidale... ...	2	13/10/48	William Thompson Masonic School, Baulkham Hills	52	10/6/48
Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48	Youth Welfare Association of Australia ...	171	14/4/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49			

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein uuless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Penicillin Treatment for Mastitis Simplified.

PENICILLIN is being more widely used by dairy farmers for treatment of mastitis in their herds. In cases of this disease due to Streptococcal germ, results have been very satisfactory, although with the Staphylococcal form, as might be expected, the percentage of cures is not high.

With the object of simplifying injection of penicillin into the udders of cows for treatment of mastitis, the Commonwealth Serum Laboratories are now putting out a special preparation of penicillin in collapsible tubes.

The tube has a small nozzle covered by a screw cap. When using, it is only necessary to disinfect the tip of the cow's teat with a little methylated spirits, then remove the cap on the tube and insert the nozzle into the teat.

Supplies of this special preparation are somewhat restricted at present, but it is expected that they will be more freely available to dairy farmers before long.—W. L. HINDMARSH, Chief, Division of Animal Industry.

Feed for Pigs Must Be Wholesome.

BECAUSE the pig will dispose of classes of food which otherwise would be of no economic value on the farm, it is looked upon as a scavenger, and many articles of food are fed to it in a putrefying or mouldy condition.

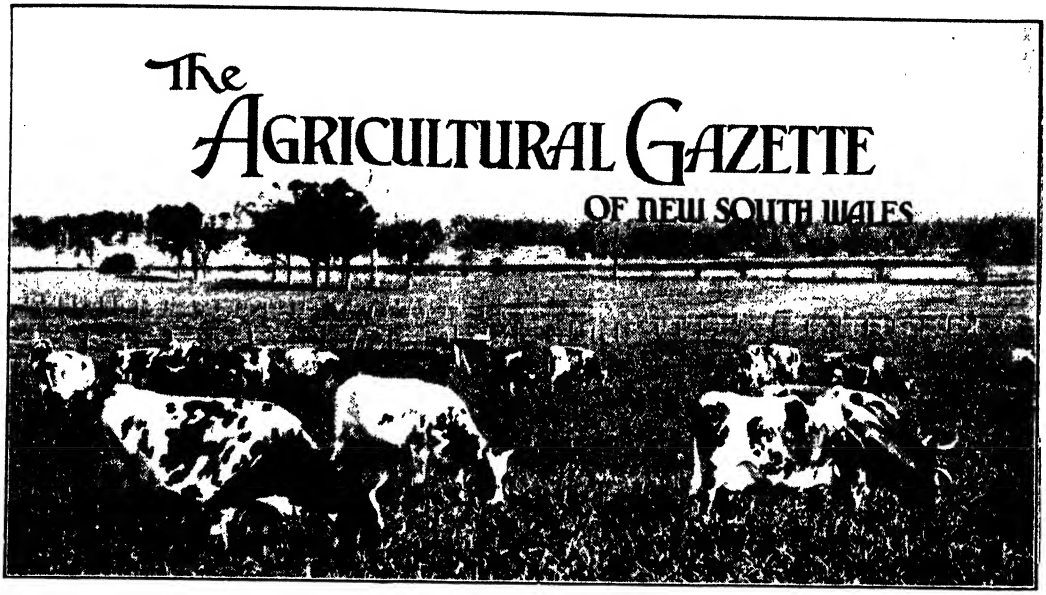
Such foods, however, are a fruitful source of disease, and the flesh of animals so fed will be of poor quality. The quality of the bacon depends on the food given, and first-class flesh cannot be expected from pigs unsuitably fed.

Skim milk and butter-milk are excellent foods if fed fresh and sweet, but to store them in insanitary tanks, casks or other containers until they are semi-putrid is merely to invite trouble.

Where swill and hotel refuse is collected for food it should be fed before it becomes soured, since there is great danger of poisoning from soured swill. In addition, it should always be boiled before use.

Fruit, vegetables, and root crops when rotting are also a common source of digestive derangements, while maize fed in a mouldy condition may cause poisoning and nervous disorders.

The danger of sickness may be lessened in all these cases by boiling the food before giving it to the pigs.—DIVISION OF ANIMAL INDUSTRY.



Editorial—

STOCKTAKING
In Dairying Industry.

COMMONWEALTH and States are to make a determined effort to seek out and rectify shortcomings in Australia's dairy industry.

Finance for a five-years' drive for greater dairy production is being supplied by the Commonwealth. Departments of Agriculture in all States are to implement the drive.

Success of the drive, however, rests largely with dairy farmers. Benefits (immediate and long-term) to the industry and the individual will depend on the amount of interest and practical co-operation afforded State Departments of Agriculture by dairymen and their organisations.

Emphasis will be placed on all the aids to better dairying which are at present largely neglected—adequate and correct feeding, pasture improvement, cropping, conservation of fodder, herd recording, better bulls and better milkers, mechanisation and up-to-date equipment.

Reasons for non-adoption of recommended practices will be diagnosed in a survey of wastage in the dairy industry.

The drive visualises more than a mere appeal to dairy farmers. It is hoped to set up demonstration farms so that all may see and be convinced of the profitableness of translating up-to-date recommendations into practice.

To encourage quick spread of demonstrated methods to individual farms, competitions are contemplated in all dairy districts, prizes going to farms which show greatest improvement in efficiency.

Encouragement will also be given to dairy farmers to improve their milking herds by the use of better bulls and by herd recording. This, of course, implies a scheme for profitable disposal of culls. The present practice of disposing of culls to a neighbour is doing little for the dairy industry as a whole.

Adequate and correct feeding for improvement and maintenance of production will be stressed and demonstrated in this five-years drive. Lack of feed is a limiting factor in dairy production, and the answer to the feed problem is improved pastures, more cropping and conservation of fodder. To make assurance doubly sure, however, no scheme—short-term or long-term—for dairy production improvement can afford to overlook the importance of water conservation.

The extent to which lack of feed governs output of dairy products is well illustrated by statistics for good and bad seasons. In an

unfavourable season, New South Wales butter production has been as low as 750,000 cwt., compared with 1,278,000 cwt. in the peak production of year of 1933-34. The difference—about 500,000 cwt.—is due entirely to adequate feeding.

In a normal good year New South Wales produces about 1,000,000 cwt. of butter. This is still approximately 270,000 cwt. below what can be produced when nature takes a hand and improves pasture growth, as in the excellent season of 1933-34. Those figures indicate that a yearly increase in production of at least 25 per cent. could be expected from the widespread adoption of pasture improvement alone, insured, of course, against failure by irrigation from small-scale or large-scale water conservation schemes.

In the absence of irrigation, the only insurance against decreased output in dry times is fodder conservation. Improved pastures are of little avail in such circumstances. The value of conserved fodder to the dairy industry is well illustrated by the fact that production has fallen in a dry year 80,000 cwt. below the output of an average good season.

When output for our peak production year is compared with production for average years it becomes strikingly evident that our present dairy herds—admitted to be capable of vast improvement—are producing in most years, well below their capacity.

If this drive can effect improvement in dairy herds and ensure that they are adequately fed, its potential for increased production in the dairying industry is immense.

Short Refresher Courses for Ex-Servicemen at Yanco Experiment Farm.

THE following Short Refresher Courses for Ex-servicemen at Yanco Experiment Farm have been arranged for the balance of the current year:—

Number 6 Course.—9th August to 1st October, 1948.

Number 7 Course.—11th October to 3rd December, 1948.

Ex-servicemen who have been discharged for less than one year who desire to attend a course may apply to:—

The Deputy Director Re-Establishment, Ministry of Post-War Reconstruction, Grace Building, York-street, Sydney.

All ex-servicemen who hold a Qualification Certificate under the War Service Land Settlement Scheme, irrespective of the date of their discharge, are eligible for the course and should apply direct to the Deputy Co-Ordinator Rural Training, N.S.W., Department of Agriculture, G.P.O. Box 36A, Sydney.

The course includes farm management, elementary veterinary science, animal production, and feeding. Specialist groups are formed from students interested in sheep and wool, mixed farming, pig and dairy and horticulture.

Office and Staff Quarters at Yanco Experiment Farm.

GRASSHOPPER CONTROL.

Some Recent Developments.

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(*Continued from page 236.*)

TIFA Suitably Mounted on a Jeep, for use under Field Conditions.

[*After Lister-Todd.*

S. L. ALLMAN, M.Sc., B.Sc.Agr., Senior Entomologist, and
J. A. WRIGHT, B.Sc.Agr., Entomologist.

THE first section of this article appeared in May issue. It dealt with the use of poison bran baits and of aircraft for spraying and dusting grasshopper swarms.

In this portion the authors describe such recent developments as insecticidal fog applications and the use of new-type dusts by ground dispersal.

THE TODD INSECTICIDAL APPLICATOR (TIFA).

The Todd Insecticidal Fog Applicator is a development of the oil fog or smoke screen generator manufactured by the Todd Shipyards Combustion Equipment Division for use by the United States of America Navy. A dense fog, consisting of very minute particles of insecticide dissolved or suspended in oil or water, is produced. The size of the fog particles can be regulated through a range from ½ to 60 microns (a micron is a spherical particle of which the diameter measures 1/25,000th inch).

The actual fog or aerosol is produced by spraying the solution or suspension of insecticide into a mixing chamber, where it comes in contact with a hot air blast generated by using a blower to force air into a combustion chamber in which petrol is continuously ignited. The temperature of the hot gases so developed approaches 1050 deg. Fahr., but this is reduced to approximately 500 deg. in the mixing cup outlet. The very brief contact of the insecticide with the hot gases does not cause any appreciable decomposition of the common insecticides.

The distributor head through which the aerosol is finally discharged may be set in any one of 144 positions and so gives an effective range of directions for treatment. This distributor head becomes very hot and the handles are lagged with asbestos to allow comfortable manipulation. Burning will result if the hands are placed in the fog within a foot of the distributor head, but due to the rapid cooling which takes place no discomfort is felt when the hands are 2 to 3 feet from the outlet.

The actual performance of the TIFA machine has been extensively investigated both in America and in England and considerable information is available for its effective operation[2].

Field Trials Conducted.

The first Australian tests of this machine were carried out in New South Wales, and were in the nature of field trials to determine specifically if the method and the

machine offered a practicable means of dealing with massed grasshopper swarms. The initial tests were carried out at Forbes and the series was later extended to Narromine and Wagga.

Preliminary runs were made using Diesoline or water without insecticide, and the fog was drifted over the ground on which suitably located indicator papers were placed to determine the effective range.

It was immediately obvious that even light winds interfered with outdoor fogging operations and that it was necessary to develop a technique of fogging across the wind to utilise wind drift. It was just as plainly obvious that the light spectacular fogs produced by oils were more or less unmanageable, even at the largest particle setting (60 microns), as the oil fogs quickly drifted some hundreds of yards from the machine and only a relatively small proportion appeared to come in contact with the ground. On the other hand water produced a much less perceptible aerosol which, however, appeared to drift closer to the ground. Observation of the aerosol drift against the light or by standing in the actual drift showed that the cover, although not readily apparent, was really quite effective over a range of at least 22 yards.

As a result of these tests it was considered that a water-based aerosol could effectively treat a swathe one chain in width and that the method offered a means of direct application of insecticides to massed 'hopper swarms.

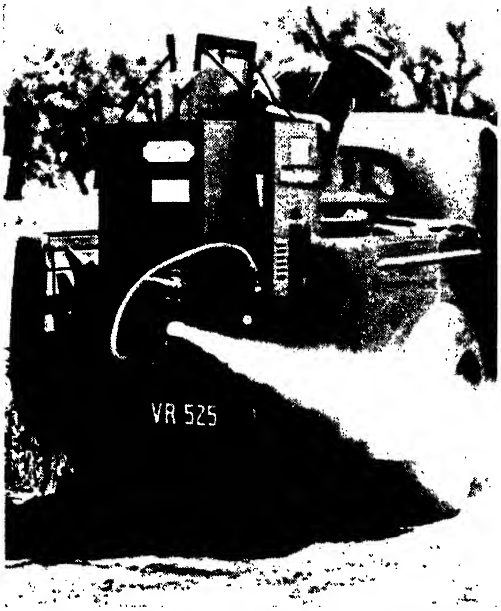
The control tests were carried out under a wide variety of conditions and at varying times of the day. Temperatures ranged from 70 deg. Fahr. to 103.5 deg. and relative humidities from 13 per cent. to 100 per cent. and actual rainfall. At the temperature of 70 deg. Fahr., with intermittent rain showers, the fog hugged the ground for at least two chains. On the other hand, at a temperature of 103.5 deg., with a relative humidity of 13 per cent., strong upward air currents lifted oil fogs vertically into the air some 10 to 15 yards from the machine. However, even under such adverse conditions water suspensions were effectively used and swarms wiped out. Wind velocities were not measured, but they were estimated to range from zero to 15 m.p.h.

The technique finally evolved was to drive the truck mounting the TIFA at right angles to the direction of the wind, and if the swarm was of sufficient width parallel traverses one chain apart were made. The distributor head outlet was directed downwards so that the fog stream first touched the ground several feet to the side of the truck, which was usually driven at 3 m.p.h. along the determined line of treatment. On this basis and taking the effective fogging swathe as one chain in width the rate of application was 2 to 3 gallons per acre. The time taken to treat one acre was approximately 3 minutes.

The Spectacular Fog or Aerosol Produced by Diesoline.
Note the fog penetration of the ground cover in the foreground, and the quick rise away from the machine.

An even distribution of insecticide over the full swathe does not occur, as naturally the area of greatest concentration is close to the machine. This may not be entirely a disadvantage as the machine is normally driven along the face of the massed swarm where the maximum density of 'hoppers is found.

It was considered that water suspensions rather than water solutions or emulsions offered more chance of effective ground treatment under outdoor conditions where



The Fog or Aerosol Produced by a Water Suspension.
Note the attentuated fog which is scarcely perceptible compared with the oil type.

wind and upward air currents might interfere with the drifting of the aerosol over definite areas. Although the machine was set at 60 microns for this type of outdoor work, it was unlikely that an aerosol of this measurement was delivered with the concentrated aqueous suspensions which were found more consistently effective.

Formulations Tested.

The following mixtures were used in the course of the experiments, the concentrations being as stated below:

1. Benzene hexachloride*, 50 per cent. water dispersible powder (6.5 per cent. gamma isomer). Suspension, 1 lb. in 1 gallon of water (equivalent to ½ lb. crude B.H.C.).

2. Benzene hexachloride-xylol emulsion concentrate. Water emulsion, 1 quart of concentrate to make 3 gallons (equivalent to 1½ lb. of crude B.H.C.).

3. Benzene hexachloride, 5 per cent. in a mixture of xylol (1 pint)-Diesoline (3 parts). Equivalent to ½ lb. of crude B.H.C. per 1 gallon of mixture.

4. Chlordane-xylol emulsion concentrate. Water emulsion, 1 pint of concentrate to make 2 gallons (equivalent to 1 lb. Chlordane).

Results of Fogging Tests.

Immediately the benzene hexachloride aerosol drifts on to the 'hoppers they become intensely agitated and hop vigorously up and down for some seconds, thus giving the insecticide more opportunity for contact than if they remained inactive. The 'hoppers gradually settle down and in the course of the next 10 minutes some individuals begin to exhibit the tremors and lack of co-ordinated movement characteristic of the effects of benzene hexachloride. Such affected 'hoppers soon fall sideways to the ground. A good indication of effective treatment may be evident within 15 minutes, but the full effect may not be seen for 24 hours or even longer. This lag in obtaining results is largely due to the fact that although massed swarms may be treated, stragglers and even new swarms have entered the test areas.

Fogging across the line of march, as along table drains for swarms crossing roadways, may hold up the movement and tend to change the direction of advance. This hold up is usually only temporary, and treated areas are crossed after a period of approximately 15 minutes. A pronounced residual effect has been noted and stragglers as well as succeeding swarms have been killed. It was not unusual to find dead and dying 'hoppers up to 300 yards from the treated areas. This residual effect persisted for periods up to ten days.

The above remarks apply particularly to benzene hexachloride-xylol emulsions or water suspensions and not to the benzene hexachloride-Diesoline mixture which proved ineffective.

* All formulations using benzene hexachloride were derived from a crude benzene hexachloride having a 13 per cent. gamma isomer (the active constituent) content.

Chlordane, a more recently developed insecticide which has been used very successfully in the United States of America, was found to be slower in its action, although equally as effective in the end as benzene hexachloride. In addition, it had a pronounced residual effect, which was particularly noticeable in fresh green growth. American experience also bears this out, although the view is generally held there that really effective results are not evident until the third day and that this insecticide acts mainly as a stomach poison[10, 11]. However, against massed 'hopper swarms of the Australian Plague Locust, Chlordane obviously acts as an efficient contact insecticide.

The cheapest and most consistently effective mixture tested was a 50 per cent. water dispersible powder of B.H.C. mixed at the rate of 1 lb. in 1 gallon of water. The rate of application was 2 to 3 gallons per acre. The actual amount of crude benzene hexachloride applied per acre was therefore 1 to 1½ lb., equivalent to approximately 2 to 3 ounces of the active gamma isomer, and this is approximately one-third of the rate considered necessary for the control of the more scattered populations of the various species of grasshoppers found in the United States of America. The experimental water dispersible powder used was difficult to mix and settled out quickly, and so required efficient agitation. Improvements in these respects would be necessary if the method were to be adopted for general use.

DUSTING AS A MEANS OF CONTROL.

Dusting by either hand- or power-operated equipment offers an easy and fairly rapid method of treatment of massed swarms. For the small landholder an ordinary hand, rotary duster would be quite satisfactory and would enable adequate treatment of all swarms to be carried out, and in many instances would suffice for use on the larger holdings. Power dusters of the Y-2 type, fitted with a boom and a number of outlets, would be an advantage on the larger holdings due to the greater speed of operation.

Following the use of aircraft last season for treating linseed crops with D.D.T. dust, this method also was used experimentally on two occasions against grasshoppers in the Tamworth district. Until the recent development of various new insecticides no really effective dusts have been available. However, with the advent of the various chlorinated hydrocarbons, benzene hexachloride, Chlordane and Toxaphene, further consideration of the possibility of dusts became necessary. Australian experience was confined initially to benzene hexachloride but has now been extended to Chlordane and Toxaphene dusts. The rates of application generally ranged from 20 to 30 lb., equivalent to 1 to 1½ lb. of insecticide per acre for the 5 per cent. dusts.

Benzene Hexachloride Dusts.

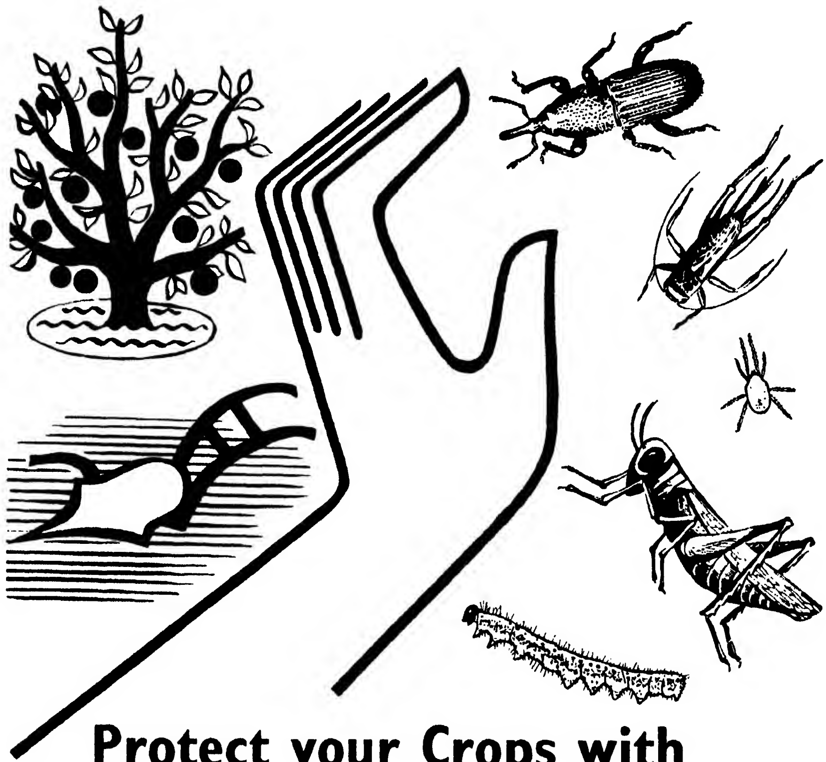
Tests with various concentrations have indicated that for general use a 10 per cent. dust (1.3 per cent. gamma isomer content) may be satisfactory. It was found, however, that such a dust or even a 20 per cent. concentration had little effect on fifth instar 'hoppers, and that consistently good results were not always obtained against younger 'hoppers. A firm recommendation for general use cannot, therefore, be made.

This insecticide produces great agitation among 'hoppers of all ages, causing them to jump vigorously up and down, and immediately after the application they move rapidly away from treated areas. Small swarms have been surrounded by a dust barrier and the 'hoppers concentrated along the barrier for periods up to two hours before breaking through and continuing their advance.

Benzene hexachloride dusts may thus have a use in repelling 'hoppers from valuable crops, pastures, lawns, bowling greens, golf greens, etc. A test carried out on a bowling green at Trangie which was being invaded by large numbers of flying grasshoppers showed that a 10 per cent. dust not only caused all grasshoppers to leave the green immediately it was applied, but protected the green from further injury for at least sixteen days. During this period large numbers of grasshoppers which alighted on the green were quickly killed before they had time to damage the grass. It would seem that the benzene hexachloride was acting as a stomach poison and the small quantity ingested was sufficient to induce paralysis within a few minutes, death ensuing shortly afterwards.

Chlordane Dusts.

This new insecticide, a chlorinated hydrocarbon also known as "1068," has proved very effective against younger 'hoppers, but



Rotary Hand Duster in Operation.
[Photo—A. H. Friend.

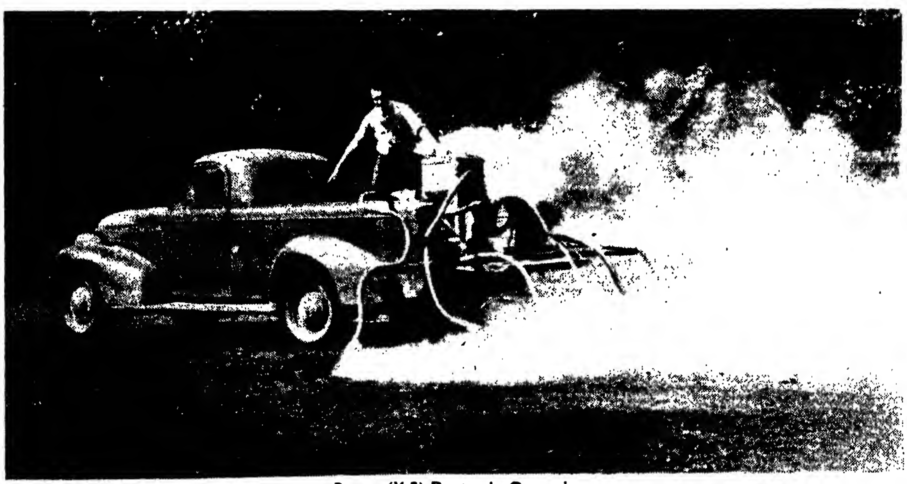
as with benzene hexachloride was not entirely satisfactory against fifth instar material. It has an excellent residual effect and 'hoppers feeding on treated areas, up to a month after application, were killed.

It has little repellent or agitative effect compared with benzene hexachlordide and 'hoppers appear to be more or less indifferent to its presence until they become affected. They then have difficulty in hopping, jump into the air and are often carried along the ground by the wind and, consequently, dead 'hoppers may be found in drains, hoof marks, etc., some distance from the treated areas. It was rapid in its action and affected many 'hoppers within a few minutes. Paralysis soon set in and within several hours a mortality approaching 100 per cent. was often achieved.

Experiments carried out with dusts containing either 2 or 5 per cent. Chlordane in a talc base showed that the 2 per cent. dust was quite satisfactory and there seems to be little need to use the higher concentration, especially as massed swarms were directly treated and the residual effect was not the main consideration.

Perhaps the most spectacular result obtained using a 5 per cent. Chlordane dust was in a test at Tamworth when the material was distributed by a Tiger Moth plane. The plane was fitted with a hopper with a 5-inch diameter discharge pipe which had the end fish-tailed and directed towards the tail of the plane. The dust fed through by gravity and suction and on emergence into the slipstream was dispersed in a swirling cloud some 30 feet in width, or approximately equal to the wingspan of the aircraft.

Dusting was carried out at 5 a.m. and the plane flew only a few feet above the ground. Parallel runs 30 feet apart were made into a very slight breeze of 3 to 4 m.p.h. and with an air temperature of 60 deg. Fahr. Some lateral drift of dust occurred but 3.6 acres were effectively treated at the rate of 23 lb.



Power (Y-2) Duster in Operation.
[Photo—A. H. Friend.

of dust per acre. The dust was readily visible on the ground and on the weed cover and indicated an effective treatment. Examination six hours later showed an almost complete wiping out of the massed swarms of third instar 'hoppers which previously had covered half of the test area. This extremely rapid kill again suggested a contact rather than a stomach poison effect.

Chlordane dust may therefore be considered as definitely superior to benzene hexachloride dust and has given consistently good results against the younger 'hoppers. Both insecticides have, however, been used unsuccessfully against fifth instar swarms. There is also some evidence that dusting strips with Chlordane instead of treating the whole of an infested area may be sufficient to wipe out swarms, particularly in green growth favourable for feeding and shelter. Grasshopper swarms and stragglers have been observed on many occasions to enter Chlordane-dusted areas and undoubtedly the persistence of the insecticide and lack of repellence both contribute to the efficiency of the dust.

Toxaphene Dust.

Like Chlordane, Toxaphene is a chlorinated hydrocarbon (camphene), but of even more recent development, and has shown distinct promise against grasshoppers in the United States of America.

Unfortunately only a single test of a 5 per cent. Toxaphene dust was carried out last season, due to the late availability of the material.

No quick reaction to the dust was evident, and even after a lapse of 24 hours only very few dead 'hoppers were observed. However, the 'hoppers left the test area shortly after dusting and no reinfestation took place for at least five days. It would appear that Toxaphene is markedly repellent and may be of considerable use in protecting growing crops, lawns, etc. It is also evident from this result that a 5 per cent. Toxaphene dust does not possess any great contact efficiency and certainly is inferior to both Chlordane and benzene hexachloride in this respect.

Dust Application by Low-flying Plane.

D.N.C. (Di-nitro-ortho-cresol) Dust.

D.N.C. dusts have been used fairly extensively in the United States of America and more recently have been distributed from helicopters in the Argentine*. Australian experience with this type of dust is limited to a single test last season. The dust supplied by the manufacturer was faulty and an effective dusting treatment was out of the question. However, the persistent yellow staining and plant-killing action when effective concentrations are used, present two serious objections to the general use of this insecticide.

(*To be concluded.*)

References will be given at the end of the concluding portion of the article.

PRIMARY PRODUCERS' INCOME TAX RETURNS.

Deductions and Depreciation Rates Allowed.

JOHN L. GREEN, H.D.A., Assistant Principal Agronomist.

FREQUENTLY officers of the Department of Agriculture are asked by farmers whether or not the cost of certain farm improvement work is an allowable deduction for taxation purposes. The following statement, which has been checked with the Taxation Department, will provide primary producers with a useful guide as to the allowable deductions for improvements and depreciation.

Allowable Deductions for Farm Improvements.

Section 75. of the Income Tax Assessment Act was amended during 1947. This section of the Act is of particular importance to primary producers, since it deals with allowable deductions. It is quoted below in full.

Sec. 75.—INCOME TAX ASSESSMENT ACT, 1936-1946
(*As amended by Act No. 11 of 1947*).

75. (1) Expenditure incurred in the year of income by a taxpayer engaged in primary production on any land in Australia in—

(*a*) the eradication or extermination of animal or vegetable pests from the land:

(*b*) the destruction and removal of timber, scrub or growth indigenous to the land:

(*c*) the destruction of weed or plant growth detrimental to the land:

(*d*) the preparation of the land for agriculture:

(*e*) ploughing and grassing the land for grazing purposes:

(*f*) the draining of swamp or low-lying lands where that operation improves the agricultural or grazing value of the land:

(*g*) preventing or combating soil erosion on the land, otherwise than by the erection of fences:

(*h*) the construction of dams, earth tanks, underground tanks, irrigation channels or similar structural improvements, or the sinking of bores or wells, for the purpose of conserving or conveying water for use in carrying on primary production on the land: and

(*i*) the construction on the land of levee banks or similar improvements having like uses:

shall be an allowable deduction.

(2) The amount of the deduction which would otherwise be allowable under paragraphs (*g*), (*h*), or (*i*) of the last preceding subsection shall be reduced by the amount (if any) of the expenditure which the taxpayer has been recouped or is entitled to be recouped by the Commonwealth or a State or any public authority of the Commonwealth or a State or by any other person where the amount recouped or to be recouped is not or will not be included in assessable income

In explanation of certain points in this amendment of the Act, the following will be helpful:—

(*h*) *Dams.*—At the present time the term "dam" covers all types of structures constructed of earth, concrete, stone, timber, etc., for holding and retaining water. Primary producers should claim the full initial expenditure on this work.

(*h*) *Irrigation Channels.*—This term covers all types of irrigation channels, including concrete. It also includes any lengths of piping used for crossing roads, etc.

Depreciation Rates.

Initial Depreciation.

An initial depreciation of 20 per cent. is allowed on all items in the list on page 290 purchased or constructed prior to 30th June, 1950. The Act operates until that year only, but may be extended further by legislative action.

The amount obtained after making the initial depreciation, is used as the base figure for the normal annual depreciation permitted under the Income Tax Act.

The following is an example of how depreciation is determined on the purchase of a new item of plant.

A tractor is purchased on 31st December, 1947, for £400. The "initial depreciation" of 20 per cent. is allowable immediately, and on £400 is £80. This is shown in the depreciation list attached to the primary producer's income statement. In addition, normal annual depreciation is allowed on the tractor, using £320 as the base value, which figure is the original cost price of £400, less £80 "initial depreciation." On

a tractor 10 per cent. annual depreciation is allowed, which would amount to £32, but as the tractor was purchased on 31st December, 1947, only a proportionate amount is allowed, which in this example amounts to £16.

The total amount of depreciation allowed on this tractor for the year, 1947-48, is £96.

Annual Depreciation Rates.

Primary producers are often doubtful as to the depreciation rate on items of farm plant. The following list supplies this information.

It must be understood that these depreciation percentages refer to primary producers only. Incidentally, poultry farmers are not considered to be agriculturalists under the Act, and many of these depreciation charges do not apply to poultry farmers.

Item.	Percentage.
Fences	3
Farm Buildings (not including private homes) ..	3
Grain Silos	3
Bridges	5
Bores	7½
Concrete Sheep Dips	2
Farm Machinery (all types of plant not classified elsewhere)	10
Tractors	10
Farm Vehicles	10
Boilers	5
Motor Truck	15
Windmills (including piping)	5
Water Supply Piping (including pumps)	5
Spray Irrigation Plants ..	5
Shearing Plant	7½
Dairy Plant (power)	5
Dairy Plant (other)	10
Fruit Growers' Plant	10
Incubators	5

The following explanations are given in regard to some items on which there is part depreciation and on some on which there is no depreciation, but maintenance costs are allowed.

Motor Car.—If used entirely for the business of the farm 15 per cent. depreciation is allowed. If, however, used partly on business and partly on pleasure, a proportionate amount of depreciation is allowed. As an example, suppose a motor car valued at £400 at the beginning of the year is used 25 per cent. only on business. The allowable deduction on this car would be £15; that is one-quarter of £60, which is 15 per cent. of £400.

Ground Tanks, Dams, and Irrigation Channels.—No depreciation is allowed. It is presumed that the cost will have been claimed in full when putting down the tank. Cost of cleaning out and maintaining is an allowable taxation deduction.

Residences.—No depreciation is allowed. It is assumed that the settler will have received the personal benefit of the residence by residing therein.

Poultry Farmers.—Section 54 of the Income Tax Act provides for depreciation of structural improvements used in agricultural or pastoral pursuits. It has been decided that a poultry farmer is not classified as being engaged in either of these pursuits. He is allowed depreciation on plant and equipment, but not on structural improvements such as fences, buildings, sheds, etc. However, he may claim expenditure for any improvements classified as coming under the amended section 75 of the Income Tax Act, quoted earlier.

Bee Farmers.—No depreciation allowed. All equipment is considered to be of a miscellaneous nature and total replacement costs are allowed.

Small Tools.—No depreciation allowed. Total cost replacement or purchase of small tools is allowed as a full deduction in the year of purchase.

The Depreciation Statement.

An example of a depreciation statement such as a farmer should attach to his annual income tax return, is shown on page 291. If he keeps a copy of this, he will have little trouble in making out the statement for the succeeding year.

DEPRECIATION STATEMENT 1947–48.

Item.	Value 30/6/47	Depreciation Allowed.	Amount of Depreciation.	Value 30/6/48
	£	Per cent.	£	£
Header	300	10	30	270
Tractor	550	10	55	495
Hay Shed	90	3	3	87
Stables	60	3	2	58
Grain Silos (3)	95	3	3	92
Concrete Sheep Dip ...	110	2	2	108
Windmills (2)	90	5	5	85
Motor Truck	280	15	42	238
Reaper & Binder	60	10	6	54
Hay Waggon	50	10	5	45
Sundercut	40	10	4	36
Shearing Plant	110	7½	8	102
Miscellaneous Plant ...	85	10	8	77
Fencer	280	3	9	271
Total Depreciation			182	

New items of plant should be shown as actual cost. There is no need to list items with the cost price of less than £50; these may be grouped under the heading "miscellaneous plant."

Trading Profits and Losses.

An interesting point that is not generally known to farmers, is that if an item of plant costs say, £500, and the farmer sells it for £200 whilst the value on his depreciation list for the current year is £250, he is able to claim a trading loss of £50 on this particular item. Correspondingly if he sells for £300 and the valuation on his depreciation statement is £250, he has to show a difference of £50 as a trading profit.

Minister Opens Pastures Protection Boards' Conference.

"AGRICULTURE is above party politics and I will not tolerate the actions of certain Pastures Protection Boards in becoming pressure groups for political purposes, nor will I countenance the expenditure of funds obtained by them, from levies on their ratepayers, for purposes other than in accordance with the Pastures Protection Act," said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), in officially opening the Annual Conference of Pastures Protection Boards in Sydney.

Mr. Graham said that the correct procedure to adopt in any cases where Boards disagreed with policy matters was to approach his Department or himself through the Council of Advice, a body democratically elected by the Boards themselves for this and other purposes. "My door is always open to members of your Council of Advice and our relations have at all times been most helpful and cordial," said the Minister.

Departmental Imported Stud Bulls to be Available to Private Breeders.

"ARRANGEMENTS are being made for a limited number of privately-owned pedigree cows to be accepted, subject to certain conditions, for service by valuable stud bulls recently imported by the Government for the Department of Agriculture's Experiment Farms."

Making this announcement, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that the bulls to be made available would be those purchased by the Stud Stock Delegation which he led abroad last year. "These particular bulls," he said, "are considered by competent judges to be at least the equal of any bulls in their respective breeds in the British Empire to-day."

They included the Aberdeen Angus "Erison of Harviestoun" who was awarded the Championship for his class at this year's Royal Agricultural Society's Show, also the Aberdeen Angus Society's sash for the best animal of his breed in the Show. This bull sired the Champion Aberdeen Angus bull at the 1948 Perth (Scotland) Show.

The Jersey Bull, "Bellavista Samaritan Royal" which was awarded the Championship for Jerseys at this year's Royal Show and who was first of his class at the last Wagga Show would also be included.

The bulls concerned are:—

Aberdeen Angus.—"Erison of Harviestoun" and "Eblinette's General of Ada," located at Trangie Experiment Farm.

Jersey.—"Bellavista Samaritan Royal" (Yanco Experiment Farm, later Wagga Experiment Farm); "Brampton Records Pinnacle" and "Golden Conqueror" (Hawkesbury Agricultural College).

Guernsey.—"Flares 2nd of Bouillon" and "Bella Cora's Royal Star of Les Jetteries" (Wollongbar Experiment Farm).

Ayrshire.—"Carnell Perfect Pilot" (Bathurst Experiment Farm).

Friesian.—"Parkhouse Akrinjo 2nd" (Hawkesbury Agricultural College).

HYBRID MAIZE.

Scheme for Production of Registered Seed.

GROWERS INVITED TO CO-OPERATE.

APPLICATIONS are invited by the Department of Agriculture from seedgrowers who desire to participate in a scheme for the production of registered hybrid seed maize.

Maize growers throughout the State are now becoming well informed of the increased yields which are obtainable from hybrid seed maize. Trials which have been made in this State have already shown that some hybrids yield up to 20 per cent. or more greater than ordinary varieties.

Parent seed for the production of hybrid seed maize has now been raised by the Department at some of its Experiment Farms. It will distribute inbred maize seed or single cross hybrid maize seed to seedgrowers for the production of registered commercial hybrid maize seed in a scheme of seed registration according to the following conditions:—

(1) Application for registration is to be made in writing to the Department of Agriculture, Sydney, or to District Agronomists.

(2) Registration of the area for the production of registered hybrid maize seed will be granted only after inspection of the site by an officer of the Department of Agriculture and on a signed declaration by the grower that:

- (*a*) The plot for the multiplication of inbred seed will be so located that it will be at least 220 yards from other maize which may be expected to be tasselling at the same time;
- (*b*) The crossing plot for the production of hybrid seed shall be so located that it will be at least 220 yards from other maize which may be expected to be tasselling at the same time or provided that if any such other maize is sown within this distance from the crossing plot, a protective buffer area of the male parent shall be established of one additional male row for each eleven yards less than 220. At lease two male rows must be sown as a buffer on either side of the crossing block.

(3) Only one specific commercial hybrid may be grown for seed production on a farm except on farms large enough to satisfy isolation requirements.

(4) The seed increase area and/or crossing plots shall be open to inspection by officers of the Department of Agriculture at any time considered necessary.

(5) The entire acreage of each commercial hybrid grown by and/or belonging to one applicant must be eligible and must be inspected.

(6) Off type plants shall be destroyed as required by the Department.

(7) Fields shall not be passed for registration if growth conditions such as heavy weed infestation, lodging, etc., do not permit satisfactory inspection.

(8) Crossing plots for the production of hybrid seed shall not contain less than one row of the male parent to four rows of the female parent.

(9) Registration will be refused if more than 1 per cent. of the number of plants of the female parent are found to be shedding pollen.

(10) The nomenclature of the registered hybrid maize seed shall be determined by the Department of Agriculture.

(11) Inspection of the hybrid seed ears will be made, and off types or otherwise undesirable ears will be rejected for seed.

(12) Registered hybrid maize seed labels containing a declaration to be signed by the seedgrower will be provided by the Department of Agriculture. These labels shall be signed by the grower, one being placed inside and the other affixed to the outside of each bag or parcel.

(13) The seed sold shall conform to the requirements of the New South Wales Agricultural Seeds Act, 1921, and shall be graded and dusted with approved seed maize treatment material.

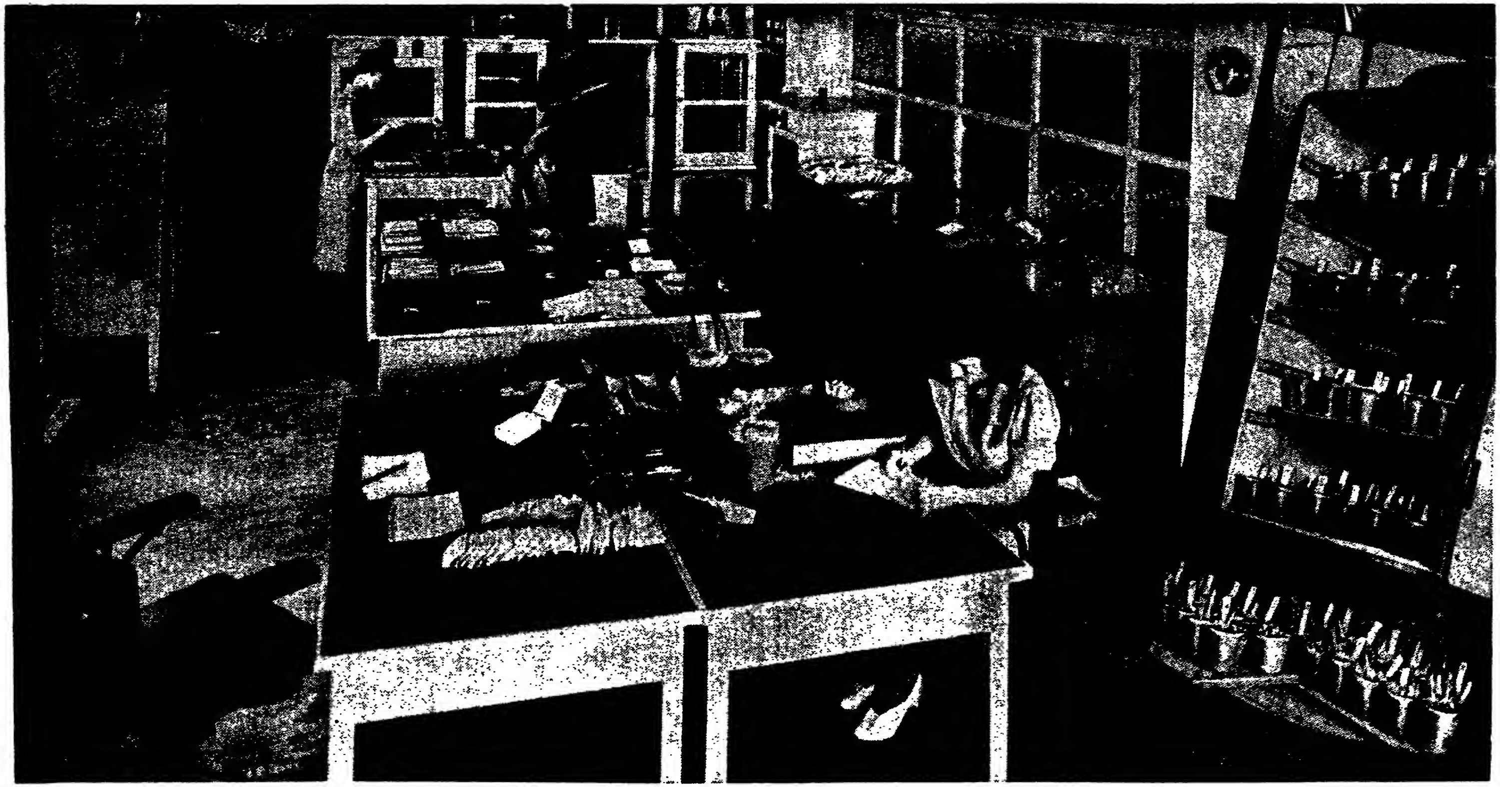
(14) A registration fee of £1 per acre shall be paid, in advance, by the grower, to the Department of Agriculture to assist in defraying expenses incurred in connection with inspections, seed testing, provision of labels, etc.

(15) The seedgrower shall furnish to the Department of Agriculture at the end of each selling season, a complete return of the names and addresses of purchasers, date of sale and quantity of hybrid maize seed sold to each purchaser.

(16) In certain cases the Department may allow the use of the term "approved" to be applied to commercial hybrid seed maize which does not comply completely with the above conditions for registration. In such cases the Department may also require that the nomenclature of this hybrid seed shall not be identical with that of any registered hybrid.

Single crossparent seed will be provided to seedgrowers under this scheme at a cost of 2s. per lb.

The closing date for receipt of applications under this scheme is 1st September, 1948.



LAWNS, GRASSES AND PLAYING FIELDS.

Their Establishment and Maintenance in Metropolitan Area.

FINE TURF PLOTS AT BOTANIC GARDENS.

H. R. RICHARDSON, B.Sc.Agr., Special Agronomist (Pastures). *

HOME gardeners, greenkeepers, and sports ground curators are often disappointed at the results obtained from their efforts to establish and maintain lawns, greens or playing fields in the Metropolitan Area. Many of these failures can be attributed to the selection of the wrong grass species, or to faulty cultural practices.

Lawn Plots at the Botanic Gardens.

With a view to demonstrating the relative value of the various accepted fine turf grasses, and to obtain more accurate information on a number of introduced species and strains, a series of miniature lawns was laid down during 1947 at the Botanic Gardens. It is intended to observe these grasses over a period of years to determine their value for particular turf purposes.

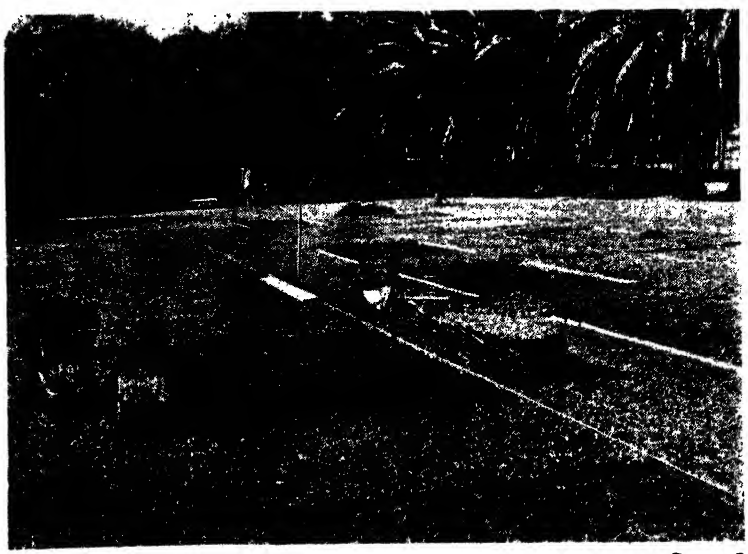
While the study of fine turf grasses is at present restricted to the Metropolitan Area, useful information concerning their likely behaviour in other parts of the State will obviously be obtained. At a later date it is intended to extend these experimental and demonstrational plots to other regions of the State.

The following notes on various species of fine turf grasses is the result of general observations by a number of workers over a period of years, as well as some initial studies of the behaviour of the grasses in these plots. It may be necessary, as further information becomes available, to modify slightly the recommendations set out below.

Couch Grass (*Cynodon dactylon*).

This is a summer-growing grass which becomes dormant during the cooler months of the year. Establishment may be carried out by seed, roots or sods. Sowing or planting should take place from October to February. Couch does best on sandy loams. Although it is one of the most drought tolerant of our turf grasses, it is susceptible to frost injury and does not remain green

* Since this article was written Mr. Richardson has been appointed Deputy Principal, Hawkesbury Agricultural College.



The Turf Plots at Botanic Gardens in Process of Construction.

so long into the winter as Blue Couch. Disease causes little trouble. Couch can be recommended for lawns, bowling greens, cricket wickets and tennis courts in the Metropolitan Area.

Queensland Blue Couch (*Digitaria didactyla*).

Although superficially resembling ordinary Couch, Blue Couch possesses shorter, broader leaves and a distinct bluish colour. Like ordinary Couch, it is a summer grower. As no seed is available commercially it must be propagated by runners, cuttings or sods. Planting should take place from October until February. It grows freely on heavy or sandy soils and will stand up to dry conditions equally as well as ordinary Couch. Frosts and cold weather do not affect it to the same extent as Couch with a result that it keeps its colour longer into the winter. Cases of Dollar Spot and Brown Patch have been recorded in this grass.

Many golf fairways have been planted with Blue Couch, and for this purpose it is excellent. It is used for golf greens on some courses and provided it is well fertilised, it is useful where the water supply is inadequate to permit the sowing of Bent grass. For lawns it is probably one of the best grasses that can be used.

Germiston Grass or South African Couch.
(*Cynodon transvaalensis*).

As this is a comparatively recent introduction from South Africa, insufficient information is available to recommend its use. In appearance it resembles a fine-leafed form of Couch with a distinctly different colour and texture. Claims have been made that it is susceptible to frost injury, but despite this, it appears to be behaving satisfactorily on bowling greens and golf tees at Bathurst and other country centres. At Taree, where one green was planted to this grass, it has been slow to form a cover. In view of the conflicting reports and unavailability of seed and difficulty in obtaining runners, it cannot be recommended for general use.

Buffalo Grass (*Stenotaphrum secundatum*).

As no seed is available commercially, this grass must be planted from runners or sods. The growing period is during the warmer months of the year so that plantings should take place from October onwards. Because it makes very vigorous growth, it is useful grass for smothering weeds. As it prefers sandy soils, it can be recommended for lawns on these soil types, particularly by the seaside. Its principal defects are the fact that it is affected by frosts and that it possesses a very coarse texture. Unless care is taken to keep it well mown, it is liable to form a thick mat which is very difficult to cut with an ordinary hand mower.

Centipede Grass (*Eremochloa ophiuroides*).

In appearance, this grass resembles Buffalo, but because it is not such a coarse grower and because it forms a thicker, closer turf, it is thought to have considerable promise. Susceptibility to frost injury is its chief defect. As seed is unavailable, it cannot be recommended for general use until supplies of roots or turf become more plentiful, when it may take the place of Buffalo.

Kikuyu Grass (*Pennisetum clandestinum*).

Originally introduced by the Department of Agriculture as a pasture plant, it has not only proved itself in that regard, but is also proving a valuable turf grass under certain circumstances. Essentially a summer grower Kikuyu remains green practically throughout the year. As no commercial seed is available, it must be planted by roots, etc. Thriving on light, sandy soils it grows less vigorously on heavy clays.

While it is probably the best grass for racecourses where the soil is light and adequate water available, it should not be used on golf fairways where couch can be established, as its heavy mat of growth slows down the run of the ball. For parks and playing fields that receive excessive wear and tear it has a place, but for home gardens its excessive vigour necessitates frequent cutting and makes it difficult to keep from spreading into the garden. For this reason it cannot be recommended for the ordinary lawn.

Temple Grass (*Zoysia matrella*).

Considerable publicity has recently been given this grass. American reports claim that it stands up to a tremendous amount of traffic, forms a good turf and requires only occasional cutting. Seed is not available in Australia at present, and even in America where it is grown extensively, the normal method of propagation is by sods or runners. An experimental area has recently been sown to this grass at the Botanic Gardens and no recommendations can be made as to its

usefulness until observations have been made on its growth in these plots.

Brown Top or Colonial Bent (*Agrostis tenuis*).

Most golf greens and some bowling greens in the Metrapolitan Area have been sown with this grass. Confusion often arises through misnaming it Creeping Bent. Creeping Bent is a completely different species that spreads vigorously by runners. Brown Top Bent, on the other hand, only spreads weakly by this means. The main growing season is during the cooler months of the year, but with adequate watering growth can be maintained throughout the whole year. Normal seeding takes place from the end of February on until June. The soil preferred is a sandy loam that retains moisture well. Frost and cold resistant, the chief defect is comparatively high cost of maintenance which mainly takes the form of extra waterings in the summer months. Dollar Spot and Brown Patch both readily affect this grass. It cannot be recommended for home lawns unless the owner is prepared to give it the attention required.

A Panorama of the Fine Turf Plots at the Botanic Gardens.

Dryland Brown Top (*Agrostis aristata*).

In New Zealand where this grass has recently been developed, it is claimed to be a slightly different type of Brown Top that is more drought tolerant than the ordinary form. Commercial seed is available in New South Wales. More information is required before it can be recommended for use in this State.

Creeping Bent (*Agrostis stolonifera*).

Many strains of this species exist, and some of them are used extensively for golf greens in the United States of America. The best known strains are Metropolitan, Washington, Cocoos, Flossmore, etc. These are the true Creeping Bents, and as they do not breed true to seed, they are normally established by runners or roots in early autumn. The creeping nature of these strains makes frequent top dressings necessary to maintain a true playing surface. They do best on sandy soils that are retentive of moisture. Like Brown Top Bent, frequent waterings are required to maintain growth during the summer months. Local observations have shown this grass to be more susceptible to Brown Patch and Dollar Spot than Brown Top Bent. In view of the fact that insufficient information is available as to their behaviour in this State, and because of the high costs of establishment and maintenance, they cannot be recommended as yet for golf green or home lawns.

Velvet Bent (*Agrostis canina*).

In appearance and texture, this is the most attractive of the bent grasses. Velvet Bent is used extensively for golf greens in

the United States of America and the United Kingdom, but to date little information is available on its behaviour in this State. In growth habit, it appears similar to Brown Top Bent in that it spreads by stolons or rhizomes, but not as rapidly as do the true Creeping Bents. Like all Bent Grasses, its main period of growth is during the cooler months of the year, but provided sufficient moisture is supplied, it will continue to grow throughout the whole of the year. It does best on sandy loam soils that retain soil moisture. As it is difficult to obtain a sample of seed that does not contain undesirable impurities, it is usually necessary to establish by roots or runners. Establishment by this means is slow. Because it is susceptible to fungous diseases and is expensive to propagate vegetatively, it cannot be recommended for the Metropolitan Area until more information is available.

Chewing's Fescue (*Festuca rubra* var. *fallax*).

Chewing's Fescue is a fine-leafed creeping strain of Red Fescue. Like Red Fescue it is particularly suited to regions possessing a cool climate, and for this reason it is used extensively in Victoria, but even under these conditions it does not persist for any great length of time. Growth chiefly takes place during the cooler months of the year, but with adequate watering it can be kept growing throughout the year. The leaves are very fine and needle-like in appearance, with a distinct dark-green colour that blends well with the Bent grasses. For this reason it is often sown in a mixture with those species. The hot dry summers experienced in the Metropolitan Area appear to be too harsh for this grass, and for that reason it cannot be recommended in this area.

Kentucky Bluegrass (*Poa pratensis*).

In Canada and the northern portions of the United States of America, Kentucky Bluegrass is used extensively as a lawn grass, as well as for pasture. Under metropolitan conditions, it does not form a good dense turf and under ordinary conditions should not be sown. It is, however, shade tolerant to a certain degree and may be sown in areas subjected to shading. Under normal circumstances its degree of usefulness in this State is limited, but at present it is useless to recommend sowing, as it is impossible to obtain seed anywhere in Australia or New Zealand.

Perennial Ryegrass (*Lolium perenne*).

This species is essentially a pasture grass that requires a high degree of fertility and adequate moisture for its best development. The tufted habit which it possesses is **not** conducive to good turf formation, but the rapidity with which it establishes itself often leads to its inclusion in commercial lawn grass seed mixtures. Despite the fact that it does give a quick green cover, it invariably results in a very rough surface, and for this reason should not be sown either in the pure state or in a mixture. The only place where it could be recommended is for sports grounds that are extensive in area where true turf conditions are not required. Even under these latter conditions it requires fertile soil conditions and adequate supplies of water for satisfactory growth. Seeding normally takes place in the autumn, and the principal growth period is during the cooler months of the year.

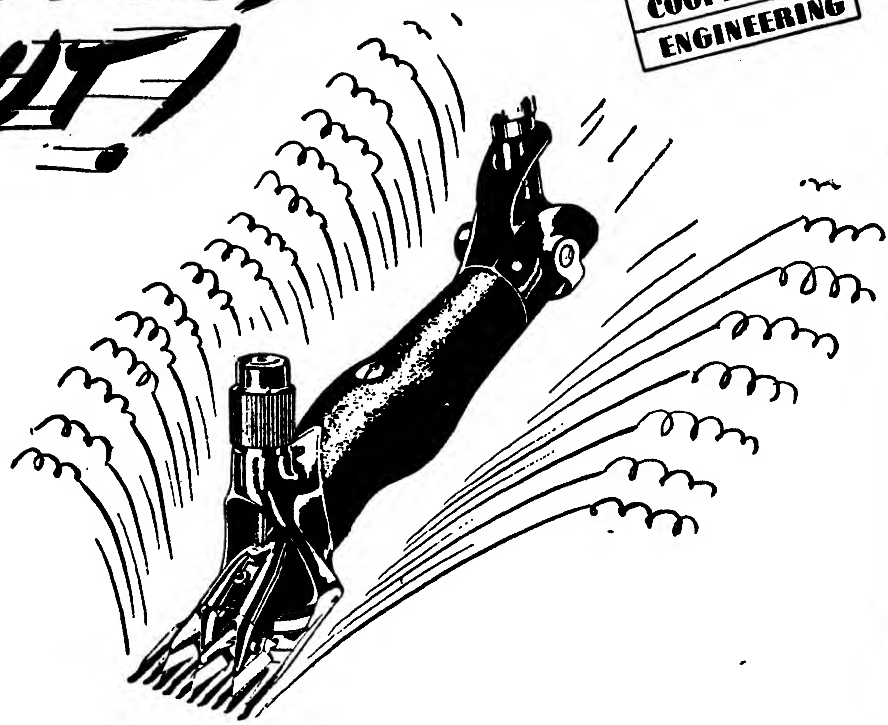
(To be concluded.)

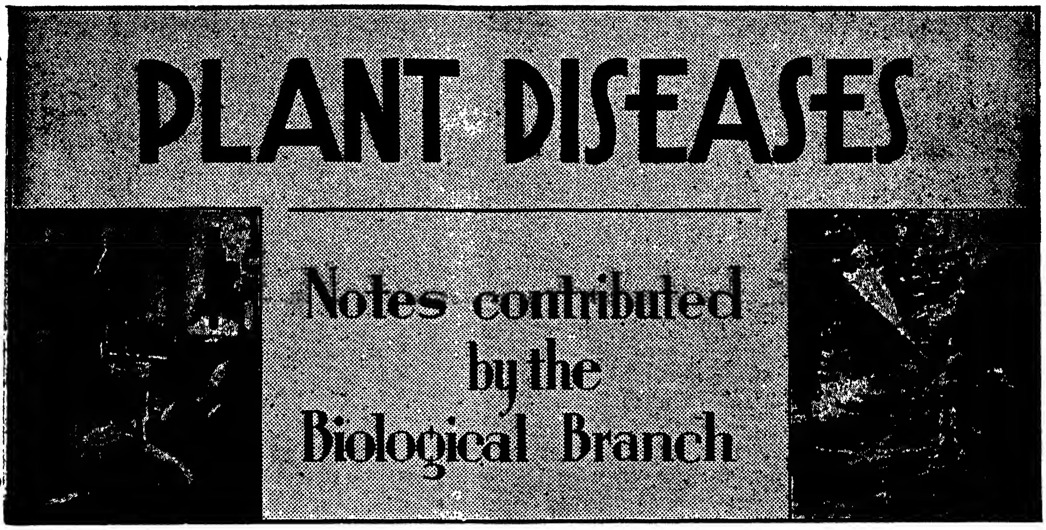
Apiarists' Conference Opened By Minister.

"THERE is every indication that honey production will increase enormously during the coming season," said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) when officially opening the Annual Conference of the Apiarists' Association on 26th May. The moist weather had stimulated the growth of eucalypts, thereby ensuring favourable conditions, said Mr. Graham.

The Minister made special mention of a gift of £1,000 by Mr. George Pender of Pender Bros. Ltd., Maitland, for the purpose of establishing an Annual Prize in Apiculture and a Scholarship at Hawkesbury Agricultural College, to be known as the W. S. Pender Memorial Prize and Scholarship. "This splendid gift," said Mr. Graham, "will perpetuate the memory of the late W. S. Pender, who was a great friend of bee-keepers and who devoted much of his life to furthering the interests of apiculture in Australia."

The Minister also referred to the value of river timbers for honey production, and said that apiarists would be greatly assisted by the recent proclamation of certain water courses, along which timber might not now be destroyed without a Forestry Commission permit.





EARLY BLIGHT OR TARGET SPOT OF TOMATOES.

W. S. SUTTON, B.Sc.Agr., A.A.C.I., Senior Biologist.

EARLY blight is probably the most serious disease of tomatoes in coastal and some inland areas of New South Wales during autumn months.

It is a fungous disease caused by the pathogen *Alternaria solani* and attacks leaves, stems, fruit stalks, sepals and, later, the fruit. On each, it causes dark brown to black markings.

Other Hosts.

In addition to tomatoes, the disease is commonly found on potatoes, on egg plants and on many common weeds known as nightshade (*Solanum* spp.) which are often prevalent in cultivation plots left to fallow.

Such weeds act as a source of infection for tomato crops.

The fungus can live over in the soil, growing on the decaying tissue of any of its host plants which may have accumulated on, or been ploughed into the ground.

Symptoms.

Seedlings.—It is quite common for the disease to attack plants in the seedling stage. In this case it usually takes the form of a collar rot injury. The stem first develops a brownish to black area, usually on one side, at soil level. This spreads rapidly in an upwards direction for an inch or more and, at the same time, girdles the stem. This has

Fig. 1.—Symptom of Early Blight.
Collar rot injury on seedling stem.
[*After Doolittle.*

Fig. 2.—Stem Lesions of Early Blight.
Develop on unsprayed plants growing under warm and humid conditions.

a ringbarking effect on the plant which becomes unthrifty, then yellows, and finally dies (Fig. 1).

Sometimes lesions appear higher on the stem as dark, somewhat elongated areas, often with a greyish centre (Fig. 2). These lesions may or may not cause girdling in the early stages, but such seedlings never thrive after being transplanted; they may die, or at best they produce few marketable fruits.

When the weather is humid, particularly when seed-beds are crowded, spores which are formed on collar rot or stem lesions spread the disease rapidly through the crop. During seasons favourable to the disease, it is only a short time before all plants in unsprayed and unrogued seed-beds develop numerous stem lesions as well as spots on the leaves. Such plants are useless for further propagation.

Plants.—Once the seedlings have been transferred to the field, it is not usual for further infection to originate on the stems, although existing lesions often continue to develop and sometimes girdle and thus destroy the plant.

However, leaf infection is unrestricted. At first the spots on the leaves are small, irregular, brown, dead areas, often surrounded by a yellowish halo (Fig. 3). The spots enlarge and may fuse, one into another, resulting in the formation of large irregularly-shaped dead areas. Isolated lesions are frequently somewhat oval in shape and may be from ¼ to ½ inch in diameter. The older leaves show the largest lesions and rapidly die, though sometimes they fail to drop. They give the basal portion a dead and dropping appearance which extends upwards as the disease progresses.

Fig. 3.—Tomato Leaves showing Numerous Small Lesions due to Attack by the Early Blight Fungus.

In many cases the lesions, both on stems and leaves of seedlings and plants, develop a series of ridged, concentric rings which are responsible for the name "target spot" (Fig. 4).

The fungus is incapable of penetrating the skin of the fruit and fruit lesions are confined to the region immediately adjacent to the fruit stalk scar. The marking on the fruit mostly develops on one side only as a dark-brown to black, slightly sunken area which closely resembles the imprint of a thumb in shape and size (Fig. 5). From the point of attack the fungus penetrates deeply into the fruit as a more or less spherical black mass (Fig. 6). The affected area later breaks down and the tomato rots.

In wet weather fruit which is showing "star-crack" is often attacked by closely related fungi, and develops symptoms which are easily mistaken for early blight. Early blight also attacks under these conditions.

Control.

During seasons when cloudy, humid and warm weather favours the development of the disease, effective control of early blight is possible only if control measures are begun before the seed is planted and are carried through until the crop has matured. Because such weather conditions are generally encountered in coastal areas in the late summer and autumn, it is the safest practice to adopt rigorous control measures every year.

Seed Treatment.—There is considerable evidence to show that the fungus may be carried on and in the seed; such seed being derived from infected fruit though not from healthy fruit grown on infected plants. Since the farmer who purchases seed is unaware of the condition of the fruit from which the seed was extracted, it is recommended that all seed should be submerged in water at a temperature of 122 deg. Fahr. for 25 minutes as a means of destroying this and other diseases.

Seed should also always be treated with a fungicidal dust, and dusts such as copper carbonate or proprietary copper oxychlorides such as Cuprox, Oxicop or Soltosan are recommended. Organic mercury dusts, which are marketed under trade names including Agrosan, Ceresan and Semesan, are also valuable. This treatment helps to protect the seedling, in its early stages, from *Alternaria* and other pathogenic fungi which may be present in the seed-bed.

The Seed-bed.—The soil of the seed-bed should be virgin to tomatoes. This assures that the seed-bed will be as free as possible from fungi and bacteria capable of causing disease in the crop.

The Seedlings.—Seeds should be planted as thinly as possible and weeds should be kept down. This will reduce the humidity and thus prove inhibitary to the development of the disease.

Fig. 4.—Leaflet showing a Spot with Characteristic Target-like Markings and Yellowing.
[*After Doolittle.*

Application of Sprays.—The application of sprays should commence as soon as the first true leaves have appeared. Bordeaux mixture 2-2-40 (see Spray Leaflet No. 1 obtainable from the Department) is recommended and should be applied at weekly intervals. Surface spraying only is insufficient and it is important that the stems as well as the leaves be wetted. Bordeaux mixture is miscible with D.D.T., sulphur and other commonly used insecticides.

Rotation.—A rotation of at least two years is desirable to prevent the possibility of carry-over of the disease in the soil.

Fig. 5.—The Early Blight Fungus attacks the Fruit at the Stem-end Scar.

Fig. 6.—The Fungus Grows into the Fruit causing an Infection of Seeds as well as Spoiling the Fruit.

After Transplanting.—A day or two after the plants have recovered from shock due to transplanting, they should be sprayed with Bordeaux mixture 1-1-40 and this spray should be repeated every ten days. Should the disease appear, the concentration of the spray should be increased to 2-2-40 and later, when all the fruit has set, to 4-4-40. Increase in spray strength is undesirable if the disease is under control.

In staked crops it is common cultural practice to prune off lower leaves as the season advances. Such prunings should be burned if they are affected by early blight.

Sanitation.—To prevent the survival of the disease in the soil, it is necesary to collect and burn all crop remains.

WARNING.—Early blight is a difficult disease to control and, unless outbreaks in the seed-beds are prevented, effective control in the field is extremely difficult. If the plant is kept growing vigorously the disease is of less importance than in poorly-grown crops.

Stud Clydesdale Stallion Imported.

THE English stud Clydesdale stallion, "Kirkbride Choice," purchased by the Department of Agriculture, arrived by the Port Lincoln.

In making this announcement, the Minister for Agriculture, the Hon. E. H. Graham, M.L.A., said that arrangements to purchase "Kirkbride Choice" had been completed after the return of the N.S.W. Stud Stock Delegation which he had led abroad last year.

My constant aim is to improve our breeds of stock," added Mr. Graham, "and it is with great pleasure that I am now able to announce the purchase, by my Department, of such a splendid stallion as 'Kirkbride Choice,' who was considered the best Clydesdale available in Great Britain."

"Kirkbride Choice" had been bred by Mr. T. Tomlinson of Croft House, Wighton, Cumberland, England, sire being "Kirkbridge Castle" (wnose performances were well-known both in Great Britain and Australia), and dam "Crofthouse Rosemary."

This stallion would be sent to Wagga Experiment Farm where his services would be available to private breeders of Clydesdales as well as to the Department's stud, said the Minister.

Defects in Dairy Utensils.

Value of Knowledge of Soldering.

No farmer has to use tinware of various descriptions to the same extent as the dairyman, and an elementary knowledge of the use of the soldering iron is of particular value in his case. In fact, this knowledge might almost be considered a necessary part of a dairy farmer's training. The mending of leaks, retinning of rust spots, refixing of milkcan hoops, etc., are all jobs possible by a man determined to master a few essentials of the process.

It is the continuous neglect of rough places in tinware that has such a serious effect on milk and cream quality, by affording lodging places for decaying milk and cream. The exposed metal is also attacked by the acid in the cream, and this is responsible for some of the flavour defects in butter. A few drops of solder will quickly rectify these tinware faults.

The process of soldering, with particular reference to its use on a dairy farm, is the subject of a leaflet which may be obtained free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

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AGRICULTURAL BUREAU . . . DISCUSSION . . .

PROBLEMS OF THE WHEAT GROWER.

(*Concluded from page* 231.)

AT this year's conference of the Macquarie Division of the Agricultural Bureau, held at Coonabarabran, a panel discussion was staged on the subject "Problems of the Wheat Grower." The participants were Dr. S. Macindoe (Principal Research Agronomist of the Department), Mr. G. Nicholson (Cereal Specialist) and Mr. E. Bond (Director of the Bread Research Institute).

In May issue a report was given of the portion of the discussion dealing with the need for soil fertility maintenance—including the use of pasture as a rotation and stubble mulch farming—and with the suitability of varieties, particularly the new rust-resistant varieties to the district.

The concluding portion of the discussion—reported in this issue—deals with the influence of the new, better quality varieties on the baking quality of our wheat, and with the value of marketing Australian wheat in classes according to baking quality.

The Influence of New Varieties on Baking Quality.

Mr. Nicholson: There is another aspect to be considered in connection with these varieties, that is, their likely influence on the baking quality of wheats generally grown in this district.

Mr. Bond: You can rest assured that any increase in the acreage planted to these new varieties will effect an appreciable improvement in the baking quality of wheats grown in the central-west. Farmers are naturally interested first in monetary return per acre, and until such times as premiums are paid for wheats of higher baking quality, these new wheats will have to battle with the old standard varieties, particularly Bencubbin. Whether they can oust these varieties in rust-free years remains to be proved, but I think that many farmers, after last year's experience of bumper crops ruined by rust, will be bound to increase their acreage of the new rust-resistant wheats.

Seasonal Planting to Avoid Cold Damage.

N.: One feature which I do not like about some of these new varieties is their susceptibility to cold or winter stem frosting. Do you think these varieties are actually more susceptible to cold injuries than some of the older varieties?

Dr. Macindoe: I would not be surprised if that were so. At least Charter, I believe, is actually inherently susceptible to stem frost damage. At the same time I think that the greater part of the cold damage experienced during 1947 was due to early varieties being planted too early. It cannot be emphasised too strongly that of the new recommendations Celebration only should be sown early, *i.e.*, with Ford and Bordan. Yalta and Kendee should not be sown before Bencubbin, *i.e.*, mid-season and probably not earlier than early to mid-May, depending on the part of the district. Gabo and Charter, if sown before the end of May, are very likely to suffer from cold injury.

N.: It may interest you to know that a survey which I made with Mr. H. Bartlett, Principal Agronomist of the Department, during the past season indicated that damage due to cold injury in crops was even greater than that from stem rust. Head frosting, *i.e.*, the frosting of the ears due to premature emergence or a late frost about heading time, is undoubtedly spectacular. However, it is relatively unimportant, and occurs usually only when varieties are sown very much out of their correct season. Stem frost damage occurs to a greater or less extent in most seasons, but often is not recognised by growers. A crop badly frosted

during the winter may cease to grow, even though seasonal conditions are favourable. Early stools die back and are replaced by second growth. In less severe cases the stem is partly killed, resulting in a weakened straw and premature haying off or ripening.

M.: What you have said is certainly true. During the past season I looked at a number of crops which farmers, and even some agronomists, did not realise were suffering quite severely from stem frost damage. The unhealthy greyish-green appearance of the crop and the tendency to hay off were sometimes the only obvious signs of any abnormality. When the leaf sheaf was removed from the stems the unhealthy puckering and browning of the stem, especially just above the node, clearly indicated severe cold injury to the tender, rapidly growing part of the stalk. In some crops severe lodging was certainly due primarily to the weakening of the stalk as a result of cold damage.

Influence of Weather Damage on Quality.

N.: I do not think the excessive rains had such a big effect on yield as was at first expected. What would you say, Mr. Bond, was the effect of the heavy harvest rains on the baking quality of the flour from the weathered grain harvested?

B.: The baking quality, taken over the State as a whole, will be poor and will present many problems to the baker. However, the effect of weather damage on quality, while serious, is not as great as I had anticipated. The low quality is due primarily to the prolific growth and high yields, with consequent lowering of protein content.

M.: Have you any actual information on that point?

B.: Yes, I have just completed a survey of quality in the various wheat-growing areas of the State. We had expected many problems from the reported high percentage of shot and sprung grain in the crop. The effect of this damaged grain on baking quality is serious, but I do not wish to over-emphasise it. In other words, the over-all effect is not so grave as was anticipated earlier. There is no doubt that our present quality troubles are due primarily to the high percentage of Bencubbin grown in this State. Actually the latest statistics show that over 45 per cent. of the State is sown to this low baking quality variety. The replacement of at least part of this Bencubbin by wheats of higher baking quality such as Gabo, Yalta, Celebration, Charter and Kendee will assist materially in raising the general level of wheat quality.

N.: As the proportion of such wheats grown may be relatively small for the next few years, I assume we cannot expect any immediate improvement in the quality of our bread.

Grading as a Means of Improving Quality.

B.: That may be true, but from discussions I have had with farmers there is no doubt that they are attracted to the new rust-resistant wheats, primarily because of the security they give them against devastating losses in a stem rust epidemic. However, the speed with which an improvement can be anticipated in the quality of our bread throughout the State is bound up largely with the question of the grading our wheats. By that I mean the separating of wheats into different classes so that the best possible use may be made of the quality characteristics of each sample.

M.: You are the first Director of the Bread Research Institute, set up by the Bread Manufacturers of New South Wales as the direct result of recommendations made by Dr. Kent Jones, who is, as we know, a world authority on wheats. While in Australia and in his subsequent report, he strongly recommended that Australia should replace the present F.A.Q. system of marketing its wheat by some system of classing or grading wheats according to their usefulness for specific purposes.

B.: That is right, grading is a big issue with us at the present time. Dr. Kent Jones showed us in a very clear manner where Australian wheats fit into the general world picture. Australia, as he pointed out, is the only major wheat-producing country in the world which does not grade its wheat—a fact which not only affects the quality of flour produced in this country, but also must prejudice overseas buyers against our wheat as far as price is concerned. At present wheat of any old quality is good enough to throw on the world's market, but these conditions will not last. Quality will then be in the demand again, and it will sell at a premium. Quality of wheat, just like quality of wool, can only be maintained under some system of grading.

N.: I understand that only about one-third of our crop is normally used for home consumption. I would like to know whether wheat quality is important in supplying the home market.

B.: Definitely; surely our own people are entitled to get a good selection of the available wheats for their own bread. Even if some of the stronger wheat was withdrawn for use locally, it is altogether wrong to assume that the value of Australian wheat on the overseas markets would necessarily suffer. Dr. Kent Jones very clearly pointed out that there is a good demand for hard or strong wheats and a good demand also for soft or weak wheats. Both types are required for special purposes. When wheat is a mixture of both these types it does not meet the needs of any particular trade.

M.: You are not suggesting, Mr. Bond, that Australian wheat has not many excellent qualities? It is probably unsurpassed for high bushel weight, low moisture and high extraction of a good white flour. I certainly agree with you, however, that the strength or gluten quality of much of our wheat, which is used mainly for bread-making, could be greatly improved; and further that wheat-growers would benefit eventually by their wheat being separated into different classes according to its baking quality. Unfortunately many people have no clear picture of what is meant by grading. Some even imagine that it is related to the cleaning and grading of grain according to size in order to prepare seed for sowing.

B.: I agree that Australian wheat has the good characteristics you mention, but these do not mean a good loaf of bread. Also, that there are many misconceptions with regard to grading. Many farmers, I know, believe that grading necessarily involves the growing of stronger wheats, and that these strong wheats will yield less. In my opinion that is entirely incorrect. Grading simply means the sorting out of wheats according to their quality. The buyer then has, at least, some idea of the type of wheat which he is being offered.

N.: How do you suggest the wheat grown in New South Wales should be graded?

B.: Australian white wheat falls naturally into three main classes. There are the hard and vitreous wheats at one end and the soft or starchy wheats at the other. Wheats which do not contain a fixed proportion, say 90 per cent., of either hard or soft grain may be placed in an intermediate class, which, for convenience, could be termed medium or standard. This separation of wheats into two or three classes is probably the simplest and most practical method of grading wheats in this State.

It is possible, of course, that we may later wish to go a stage further in separating wheats within each of the hard, medium and soft classes. This further separation would be primarily on the basis of bushel weight, freedom from shot or sprung grain, etc. At least this is the general approach to wheat grading used in the United States of America, Canada, and many other countries. Actually the grading of wheat in Australia would probably be simpler than in any other part of the world.

M.: You may be interested to know that in South Africa the wheat grading system is based purely on varieties. About ten varieties are recognised as producing on the average wheat of superior baking quality. Any sample of these varieties received, irrespective of whether it is hard or soft is placed in the "A" class. Wheat receivers need only be able to recognise these ten varieties, since all other varieties are placed in the "B" class. It is understood that in actual practice this classification according to varieties serves a very useful purpose in keeping separate the wheats of superior baking quality. We are not in a position yet to say that any particular system of grading might be best under our conditions. The main thing is for us to evolve some system which will grade wheat in such a way that a particular class of wheat will be of special value for a special purpose.

B.: That seems to be a good summing up of this grading question. Some people tend to criticise millers and bakers for advocating wheat grading. It is suggested that they are prompted by some selfish motive. That is not true. Biscuit and cake manufacturers are just as keen and interested in wheat grading as is the bread baker. It seems to me only reasonable that the producer of any commodity should try, as far as lies within his power, to produce the quality which the consumer requires. I would suggest that if Australian farmers do this, and see to it that their wheat is graded to meet the requirements of the bread

manufacturers on one hand and of biscuit, cake and pastry manufacturers on the other, it must ultimately be to their advantage. Under the present F.A.Q. system Australian wheat overseas competes only on a price market. We must try to compete on quality markets. If the farmer's wheat is marketed as two or three different grades it is likely that he will get the best possible price being offered for each class of wheat. Naturally the buyer will pay the lowest possible price for the present nondescript F.A.Q. wheat.

M.: Many farmers in this area will be testing some of the new rust-resistant varieties this year, perhaps for the first time. You would agree, I suppose, Mr. Nicholson, that they would be wise to sow a proportion of their areas to these new wheats.

N.: Yes, but we must remember also that Bencubbin, and in some sections Ford and Bordan, have proved their high yield over a number of years. It would certainly be a mistake to drop these varieties over-night until more is known of the yielding capacity of the new rust-resistant, higher baking quality wheats.

M.: You believe then that in addition to sowing Ford at least limited acreages of Celebration should be sown early and that in mid-season plantings some Kendee and Yalta should be sown in addition to Bencubbin.

N.: Yes, and for late plantings, which means planting at end of May, Gabo and perhaps also Charter should at least be given a good commercial trial. General experience indicates that very late sowings are only successful on the heavy fertile soils.

B.: At this point I would like to emphasisc that the sowing of such varieties, if consistent with the farmer's own interests, certainly represent the quickest and best means of building up the baking quality of our wheats. Growing these rust-resistant wheats will help to give a better loaf, not only because of their inherent baking quality but also because they will reduce the proportion of poor pinched grain which comes from rusted crops; this is of inferior milling and baking quality. I would very much like to see the grain harvested from these new varieties graded and marketed separately, perhaps as a Strong White class, while samples of Bencubbin would be restricted to Soft White or at the best to the Medium White classes of wheat.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Cootamundra Sheep Show	June 15, 16
Condobolin (G. L. Maxwell)	August 10, 11
Trundle (W. A. Long)	August 17, 18
Weethalle	August 18
Lake Cargelligo	August 20-21
Peak Hill (H. J. Dawson)	August 24, 25
Wagga	August 24, 25, 26
Grenfell	August 27-28
Barellan	August 28
Parkes (L. S. Seaborn)	August 30, 31, Sept. 1
Lockhart	August 31, September 1
Young	August 31, September 1
Ungarie	September 1
Deniliquin	September 3, 4
Murrumburrah	September 3, 4
Cowra	September 7, 8
Ganmain (S. J. Pratt)	September 7, 8
Manildra (H. C. Douglas)	September 7, 8
West Wyalong	September 7, 8
Corowa (W. T. Easdown)	September 10, 11
Narrandera	September 10, 11
Mangrove Mountain (W.J.Mitchell)	September 11
Barmedman	September 11
Finley	September 11
Forbes Sheep Show	September 11
Canowindra	September 14, 15
Temora	September 14, 16
Hillston	September 15
Ardlethan	September 18
Eugowra (R. S. Noble, President)	September 21, 22
Leeton	September 21, 22
Quandialla	September 22
Hay	September 24, 25
Ariah Park	September 25
Bribbaree	September 29
Cudal	October 1
Illabo	October 2
Griffith	October 5, 6
Walbundrie	October 6
Singleton	October 7, 8
Culcairn	October 9
Cootamundra (D. H. Boyd)	October 15, 16
Holbrook (Thelma Stewart)	October 22, 23

1949.

Newcastle (P. Legoe)	February 23 to 26
West Maitland (R. E. Holroyde)	March 2-5

INSECT PESTS.

Notes contributed by the Entomological branch.

San Jose Scale (*Quadraspidiotus perniciosus*).

THIS scale is an injurious pest of deciduous fruit trees throughout the world. It is present to a varying degree in most of the orchard districts in New South Wales where pome and stone fruits are grown.

It has a wide range of host plants, including almond, apricot, peach, plum, prune, and a great variety of introduced trees and shrubs. Hedges of tree lucerne may become seriously infested, and occasionally it develops on eucalypts and wattles.

The scale develops on the trunk, limbs and twigs of the trees and occasionally on the fruit. Once it is established it usually increases very rapidly if control measures are not adopted, and may seriously injure or even kill the tree. The badly infested portions have a greyish, scurfy appearance, which, on examination, is seen to be due to the presence of masses of minute scale coverings.

The fruits of apples and pears may also become infested with the scales, and this causes reddish blotches to appear on the skin, spoiling the appearance of the fruit.

As restrictions are placed on the export of infested fruit, it is important that control measures should be thoroughly carried out by growers wishing to ship fruit.

The scale covering of the adult is greyish, with a yellow or dark area in the centre. It is irregularly circular in outline, slightly convex, and about one-twelfth of an inch in diameter. The scales of the young forms are dark or almost black.

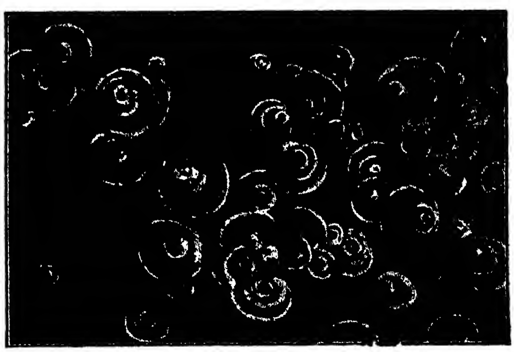
The adult female, which is hidden beneath the scale-covering, is a pale yellowish, soft-bodied insect, irregularly oval in outline, and somewhat pointed at the posterior end. It obtains its food by inserting its fine, hair-like rostral setae into the tissues of the plant and sucking up the sap from within.

The mature female insect produces live, active young which crawl out from under the parent scale, and after moving about for a short time, settle down, insert their beaks into the plant and commence to form their protective scales. The female insect remains fixed in the one place for the rest of its existence; the male finally develops a pair of wings and emerges from beneath its scale.

The reproduction and development of the scales are comparatively rapid during the summer, the period from birth until young are again produced being about six weeks. Thus several generations may be developed in a year, and as the female may produce as many as 400 young, the increase in numbers may be very rapid.

Control.

The control recommended is to spray with miscible red oil at winter strength (usually 1 gallon of oil, and water to make 25 gallons) during the dormant period. Lime-sulphur, applied at winter strength (1 in 10), has also given fair control, but is not recommended in preference to the oil spray



San Jose Scale (enlarged)

unless it is desirable also to use it for the control of fungous diseases. Lime-sulphur has given best results when applied as late as possible before the buds burst.

Where the infestation is severe, a double application may be made, using red oil in July, followed by lime-sulphur in August. An interval of several weeks must elapse between these sprays or injury to the bark and buds may result.

Peach Branch showing Gumming due to Infestation of San Jose Scale.

[*Photo by E. J. Wason.*

Semi-dormant and pale oil sprays, which may be mixed with lime-sulphur, are now on the market. A single application of oil-lime-sulphur offers many advantages, and in addition to controlling San Jose scale it also controls prune scale and red mite. The spray is mixed in the following proportions:—

Oil	1 gallon.
Lime-sulphur ..	1 gallon.

Water, to make 20 gallons.

Care should be taken to ensure that the right type of oil spray is used in combination with the lime-sulphur, and that the manufacturer's directions for mixing are followed.

In winter, during the dormant period, cherries, peaches and nectarines are commonly sprayed with tar distillates for control of aphids, and it has been frequently observed that this spray tends to encourage the development of San Jose scale, rather than to check it. Growers, therefore, are advised to modify their programme of sprays if tar distillates are regularly used and San Jose scale becomes evident. Nicotine sulphate (1 pint to 75 gallons) may be included in one of the oil, pale oil plus lime-sulphur, lime-sulphur sprays, and offers a satisfactory alternative for the control of both aphids and scales.

An efficient insecticide, now commonly used during the dormant period instead of tar distillates, for the control of aphids, is D.N.C. (dinitro-ortho-cresol in oil). This spray is used at a concentration of 1 in 40, and where it is applied each year San Jose scale is also effectively controlled.

San Jose scale often appears first on a few scattered trees in an orchard, and every effort should be made to prevent it from spreading to the other trees by thoroughly spraying all parts of the infested trees. The infested trees should be pruned before spraying, and the prunings burnt at once.

Where only a few infested trees are present in an orchard, adjacent trees also should be sprayed, as scattered scales may be present on these, although not noticeable.

It is not advisable to allow a large pool of oil to collect around the base of the tree trunk, for if the oil reaches the roots in any quantity injury to the tree may occur.

The White Rose Scale (*Aulacaspis rosae*).

THIS scale, which is almost cosmopolitan in its range, is primarily a pest of roses, but it also infests and injures raspberries, loganberries and blackberries.

It has been stated in literature that this scale will infest other plants and trees, including pear, mango, myrtle, *Ailanthus*, *Cycas*, etc., but probably these records refer to other related white scales of the same genus, *Aulacaspis*, which have been confused with *A. rosae*.

This scale almost invariably infests the stems and older branches of its food-plant, and usually, only where heavy and prolonged infestation has occurred, is it found on the younger growth.

The opaque, white scale-covering of the female insect is more or less circular in outline, somewhat convex, and measures about three thirty-seconds of an inch in diameter. The two yellowish larval pellicles

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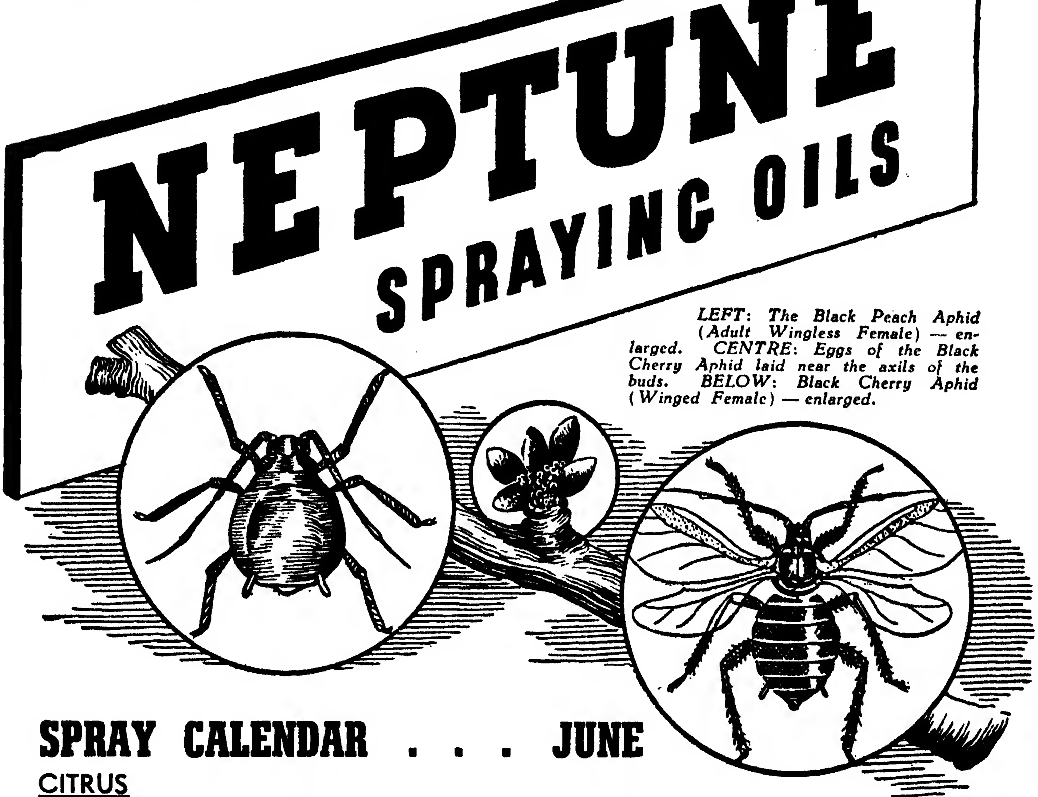

LEFT: The Black Peach Aphid (Adult Wingless Female) — enlarged. CENTRE: Eggs of the Black Cherry Aphid laid near the axils of the buds. BELOW: Black Cherry Aphid (Winged Female) — enlarged.

SPRAY CALENDAR . . . JUNE

CITRUS

White Louse. Spray with Neptune Lime Sulphur, 1 in 10, plus 1 lb. of Neptune Casein Spreader to 100 gallons. Spray as soon as crop is harvested and concentrate on trunk and limbs.
Purple Scale. Spray with Neptune Lime Sulphur, 1 in 15.

DECIDUOUS

Red Spider and Mites, San Jose and other Scales, and Woolly Aphid. Prepare for dormant spraying with Palsol or Red Spraying Oil, 5 gallons to 100.
Green and Black Peach and Black Cherry Aphid. Prepare for early spraying in July with Winsol, 1 in 40, or for late dormant with Aphidol, 1 in 40

PRUNING

While pruning, watch for pests and diseases, and for identification and control measures, consult the orchardists' illustrated handbook, "Clean Fruit," published by Neptune.
Be prepared for your winter and spring spraying by ordering now from your local Neptune agent the following Neptune sprays:—

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(cast skins of the first and second stage larvae) are usually near to or project slightly beyond the edge of the scale-covering.

There is a marked contrast in the form of the puparium or scale-covering of the male insect. It is white, and narrow, with nearly parallel sides, and measures about one-twenty-fifth of an inch in length. On its upper surface there are three raised longitudinal ridges of secretion, and a single yellow pellicle at the head end.

The adult female insect, which measures about one-twenty-fifth of an inch in length, is dull orange to red in colour, elongate, and widest in the front, where it is broadly rounded and somewhat tapering towards the tip of the abdomen. It is legless and the antennae are reduced to a single curved spine, but the sucking beak is well-developed. Females have been recorded to live for eleven months.

The adult male is a delicate, two-winged reddish insect, with well-developed antennae and legs, and a long pointed terminal style at the end of the abdomen. Its length, including the style, is about one-twenty-fifth of an inch. It has no functional mouth parts and its life is very short.

The minute eggs are elongate-oval in outline, pale crimson in colour, and are deposited by the female beneath the scale-covering, where they remain protected until they hatch some three to four weeks later. An individual female may lay up to forty or more eggs, and may deposit a second batch soon after the first.

The young, first-stage larvae or "crawlers" which emerge from the eggs, measure about one-eightieth of an inch in length. They are pale red to dull crimson in colour, flattened and oval in outline. They possess three pairs of legs, well-developed eyes and antennae.

After crawling from beneath the parent scale the larvae are very active, but soon settle down and commence to feed by piercing the plant tissues and sucking up the sap. In this early stage of their development, the male and female larvae are of similar appearance. The female insect remains in the one place for the rest of its existence and during growth casts its skin twice. It has, thus, two immature stages before becoming adult.

The male has an additional pupal or chrysalis stage before it becomes mature and thus casts its skin three times. However, only a single pellicle (its first larval skin) becomes attached to the outside of the scale-covering. The adult male, after shedding its pupal skin, remains for some time within the protective puparium, but finally makes its way out backwards, from the hinder part of the scale-covering, which is provided with an opening for this purpose.

Several overlapping generations may occur during the year.

Rose Stems showing Infestation of the White Rose Scale.

Control.

A spray of white oil emulsion diluted at the rate of 1 part of oil to 40 parts of water (4 fluid oz. to 1 gallon) may be used to control this scale. As the oil spray may not always affect eggs, which are well protected by the scale-covering of the female, a second application may be necessary about six weeks after the first.

Spraying is best carried out during the period of greatest dormancy of the plants. Cutting back of the bushes before spraying may also be recommended if the infestation is heavy. The infested prunings should be burned.

The Vegetable Weevil (*Listroderes obliquus*).

DURING this period of the year the larvae or grubs of the vegetable weevil make their appearance, and practically all winter vegetables may be attacked. Large irregular holes may be eaten in the leaves, and the new leaf growth of the crowns may be eaten away as it develops. Plants such as carrots, beetroot, turnips, etc., may be damaged below the ground.

The small legless grubs, which measure about ½ inch in length when fully-fed, are stout-bodied, and vary in colour from pale

Legless Larva or Grub of the Vegetable Weevil.

green to yellow. Although they mostly hide in the soil, around the plants, by day, many feed during the day and are to be found on the under-surfaces of the leaves or on the crowns of the plants.

These larvae become fully-fed in from four to six weeks, and they then enter the soil, where small earthen cells are constructed within which they transform into their pupal or chrysalis stage. From about the end of August onwards, they change into grey-brown adult weevils which hide in the soil by day, and come out at night to feed on the plants. The adults are most numerous during October and November.

Control.

Clean cultivation is an important factor in vegetable weevil control, but it must be remembered that the destruction of weeds late in the season will cause the insects to migrate from the dying weeds, or from the soil, into cultivated areas.

As a precautionary measure, before planting out, particularly where weed growth or crop remnants have been removed or the ground is suspected of being infested, the area, after an interval of several days, should be baited.

For this purpose, chopped leaves of lettuce, turnip, Cape weed or marsh mallow, etc., which have been either sprayed or dusted with lead arsenate, may be scattered over the ground late in the afternoon.

Where bran is available, a poison bait, prepared according to the following formula, may be broadcast over the area or partly worked into the soil, late in the afternoon. The bait consists of:—

Bran, 24 lb.

Paris green, 1 lb.

Salt, 8 oz.

Water, 2½ gallons.

The bait is prepared by first mixing together the Paris green and bran, and then making into a crumbly mash with the water, in which the salt has been dissolved.

Where crops have become infested, the bait may be distributed thinly along the rows, or broadcast over the area.

Potato Plant Damaged by the Vegetable Weevil.

With crops such as potatoes, carrots, etc., *the leaves of which are not used as food,* control may be obtained either by spraying or dusting with D.D.T. or lead arsenate.

(Continued on page 313).

FRUITGROWING

QUICK FREEZING OF FRUITS AND VEGETABLES

In U.S.A: and Canada.

(*Continued from page* 188.)

S. M. SYKES, B.Sc.Agr., Fruit Officer (Research).*

IN a previous article Mr. Sykes defined the quick freezing process, traced the history of its development, set out its importance to the primary producer and indicated generally the recent technical advances in the process.

In this issue he deals with American methods of handling fruit for quick freezing.

The Freezing of Fruits.

The freezing of fruits dates back to 1908 when the first experiments in the freezing of berries in barrels were carried out. This method of preserving fruit was not used on a large scale until about 1921, when the production of frozen fruits for institutional use expanded fairly rapidly. In 1929 small quantities of fruits were quick frozen in small rectangular packages with a Birdseye belt froster. This was the beginning of the quick freezing of fruits as it exists to-day.

The older method of freezing in large containers (10 lb. and above) is known as "cold packing" or "frozen packing." It is still practised widely and represents the greater proportion of frozen fruit output. However, the tendency has been to increase the rapidity of freezing and to store at lower temperatures than were previousy used.

The total frozen fruit pack for the whole of U.S.A. in 1946 was 523,000,000 lb., and, of this, only about 130,000,000 lb. was frozen in containers less than 10 lb. in capacity. The remainder was frozen in institutional containers ranging from 10 lb. cans and fibre containers to 50 gallon barrels. Some of the institutional packs are frozen rapidly in air blast freezers, but the great bulk of them are "sharp frozen" in rooms at about minus 10 to minus 15 deg. Fahr.

The most important frozen fruits in relation to production are strawberries, apples, red sour cherries, peaches, apricots and raspberries. The other berry fruits and prunes also form an appreciable part of the total pack.

The most successful frozen fruits from the quality angle are probably the berry fruits. Since these fruits are not preserved very satisfactorily by canning, freezing is the only method of preserving their natural flavour.

Fruits, as a whole, are difficult to preserve by freezing in that they tend to brown, lose flavour, and collapse in texture. The use of sugar, both dry and as syrup, and of anti-oxidants such as ascorbic acid has enabled many fruits to be frozen with success.

Tropical fruits are not frozen to any great extent in the U.S.A., largely because of the scarcity of this class of fruit. One company in Southern California has built up a considerable trade for frozen tropical fruits (mainly in the form of purees) with ice-cream manufacturers. Frozen pineapple is imported in fairly large quantities from Hawaii.

PREPARATION OF DIFFERENT FRUITS FOR FREEZING.

Strawberries.

The following is the procedure adopted by a large plant in Oregon:—

The berries (picked without the caps) arrive at the plant in hallocks which are packed twelve to a tray. The trays are weighed in stacks of sixteen. A sample (one hallock) is taken from every stack and graded for maturity, size and freedom from

*Mr. Sykes recently returned from an investigation of quick freezing methods in U.S.A. and Canada.

mould, mechanical injury and insects. The grower is paid on the basis of this grading.

Each tray of berries is tipped into a shallow water bath by means of a hinged unloading frame (Fig. 1A). A wire grid enables the tray to be inverted and returned to its original position without disturbing the hallocks from the tray. The berries are carried forward by water sprays to a short (about 12 feet) inspection belt where any obviously mouldy or damaged berries are removed.

By means of an elevator the berries are fed to a shaker-washer (Fig. 1B). Here the berries are thoroughly washed by water sprays directed horizontally over vibrating riddles. Each successive riddle has half the slats replaced by a continuous metal plate, so that berries moving over this closed portion of the riddle must pass on to the next inspection belt. The other portion of the berries may fall through the riddle into a shallow water bath and to the next riddle. In this way, the berries are both washed and divided between several inspection belts. In this case, two feeder lines were split by two shaker-washers into eight inspection lines. The water draining through the slats is partly recirculated through the sprays together with a certain amount of fresh water.

On the inspection belt any foreign matter, mouldy, over-ripe or green berries are removed and any capped berries are de-capped with a special small spoon. The over-ripe and green fruit is barrelled and frozen for jam.

At the end of the inspection (about 40 feet long) the berries fall into slicers made up of rotary blades with a spacing of 3/16 inch. The sliced berries are collected in large dishes which are adjusted to a definite weight on platform scales. A weighed amount of sugar is then added in the proportion of four parts berries to one of sugar. The sugared fruit is then added to the hopper of a mixer by an operator standing on a platform about 5 feet above the floor.

The mixer is a small churn-like machine with slowly revolving paddles. After a short mixing period the contents of the mixer are allowed to flow into the hopper of an Elgin filler which fills two containers at a time at the rate of forty-eight per minute. The correct amount of sliced berries is measured by volume by the filling and emptying of the machine's two cylinders. This is sufficiently accurate to fill 1 lb. containers without further adjustment of the contents.

After packaging, the cartons are placed in the freezer. Of course, strawberries and, indeed, most fruits are frozen in the packaged form.

The packing of strawberries in the sliced form is a fairly satisfactory procedure. The penetration of the sugar is greatly increased and results in a product of better flavour and colour than with whole frozen berries. There is, however, a definite need for an improved type of berry or a new method of processing in which the individual slices are not seriously affected by the slicing and mixing process. The colour of the Marshall variety (Pacific North-west) is not good for the sliced berry pack, because the red pigment is usually confined to the outer zone of the fruit and the inner flesh is much paler. With sliced strawberries, there is no need to size-grade the berries, as with whole berry packs, and irregularly shaped berries do not matter.

Raspberries and Other Berries.

A fairly large quantity of red raspberries is frozen in U.S.A. Most of the pack is in the institutional form, but the retail pack is of quite an appreciable size. Moderately large quantities of blackberries, boysenberries and blueberries are also frozen in retail packages.

These berries are usually prepared for freezing in the manner described for strawberries, except that they are not sliced and that syrup (about 40-50 per cent. sucrose) is used instead of dry sugar. Dry sugar packing (3 or 4 : 1) is sometimes used and, with the large institutional packs, sugar is sometimes omitted.

One of the main problems with raspberries is the elimination of insects. This is chiefly a matter of field control, but good washing in the plant will remove superficial insects.

Apples.

Large quantities of apples are frozen both as slices and as apple sauce. The sliced apple pack (1/12 or 1/8 segments) is used almost exclusively by the bakery trade for pie making.

The prevention of browning during processing and frozen storage is the outstanding

problem in freezing apples. A number of different methods are in use, but the most satisfactory from all points of view seems to be a light dip in sulphur dioxide or sodium metabisulphite. The strength of the solution should be 0.2-0.3 per cent. and the time of dip should be about 1 minute. The

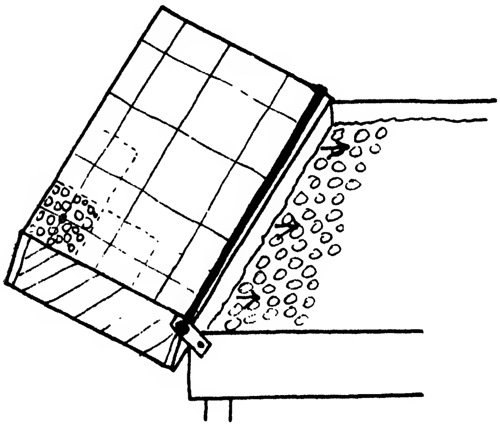

Fig. 1A.—Rack for Unloading Strawberries into Water.

dipped slices must be held for several hours before freezing to allow penetration of the SO_2. Holding the peeled and sliced apples in a light brine (about 3 per cent.) to prevent exposure to air is recommended by some people.

Steam blanching for 1-5 minutes is used widely in California instead of sulphur dioxide. Sulphur dioxide causes trouble with corrosion in the pie-bakers' ovens, so that there is some prejudice against the raw sulphited pack.

Other methods involve (*a*) the use of brine which is forced into the tissue by vacuum followed by air pressure, or (*b*) brining combined with blanching.

A dip in calcium chloride (1/500 per cent.) is often used before sulphiting in order to harden the tissue and prevent it softening too much during freezing and subsequent cooking.

The cooling of blanched apple slices is generally carried out in sprays or flumes of cold water. Much leaching of soluble solids occurs, and there is a definite need for some other method of cooling. Workers at the University of California have had good results with air cooling by means of a fan and suggest that this method could be applied commercially.

Peaches.

Peaches are frozen in fairly large quantities both for institutional and retail purposes. The peaches frozen are almost exclusively freestones, although a few clings are frozen in California. The development of browning and accompanying "oxidised" flavours is the biggest problem in their preservation by freezing, and most improvements in varieties and processing technique have been concerned with this problem. The use of ascorbic acid as an anti-oxidant has done much to stimulate the production of frozen peaches, although many peaches are still packed with sulphur dioxide as the preservative.

The various steps in the preparation of peaches for freezing are:—

(1) Hand sorting, to remove peaches not fully ripe (may be canned or held over for further ripening) and cull material (rots, etc.).

(2) Lye peeling, by immersion or by spray.

(3) Washing.

(4) Acid rinsing.

(5) Halving and pitting.

(6) Slicing.

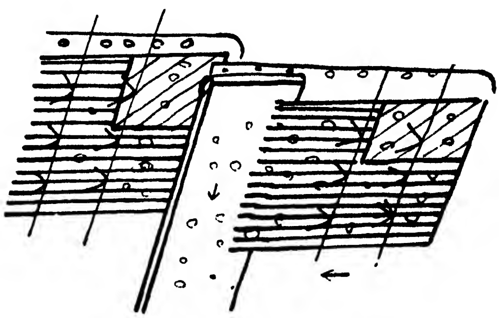

Fig. 1B.—Part of a Strawberry Washer.

(7) The addition of sugar, dry or as syrup, and ascorbic acid (about 0.2 per cent. in 60 per cent. syrup—one part syrup to three parts peaches).

Steam peeling is an alternative to lye peeling, and where practised, it usually follows the halving and pitting part of the operation, the halves being placed, with the skin side up, on a belt which travels through

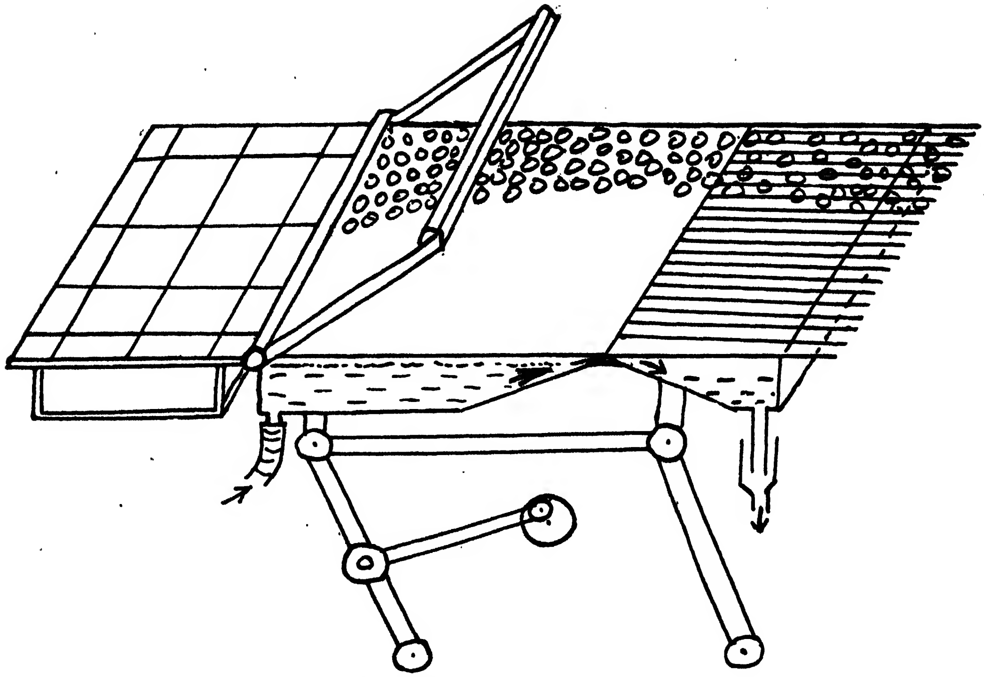

Fig. 2.—A McLaughlin Barry Washer.

a steam chamber. Steam peeling (and to some extent, lye peeling) are improved in their efficiency by allowing the peaches to "mellow" for a few days in common or cool storage. A preliminary de-fuzzing also improves the uniformity and efficiency of lye-peeling.

Apricots.

Apricots should be harvested for freezing when firm, ripe and showing practically no green colour. They are sorted, washed, halved and pitted. They are usually packed with a 40 or 50 per cent. syrup. Sulphur dioxide is used as a preservative for the pie pack and ascorbic acid for the dessert pack.

Frozen apricots are not a common product on the retail market and it is doubtful whether they will ever become very popular. The bulk packing for pies should continue but there have been some big fluctuations in the quantity packed annually.

Other Fruits.

Many other fruits can be successfully frozen. Prunes, plums, grapes, figs, passion fruit, cantaloupe, sweet and sour cherries, nectarines and many tropical fruits have given satisfactory products.

Many tropical and sub-tropical fruits, such as pineapple, papaw, and passion fruit would be frozen in larger quantities in the U.S.A. if they were in greater supply. There is quite a moderate consumption of frozen pineapples from Hawaii. It is a very satisfactory product and the flavour is very close to that of fresh pineapple. Papaw is also good in the frozen form, particularly when some juice of another more acid fruit, *e.g.*, lime, lemon or passion fruit, is added.

Fruit Purees.

Fruits are frequently frozen in a crushed or pureed form—mainly for ice-cream, or flavour bases. Where the texture or form of the fruit is of little or no importance, freezing in the form of a puree may be the best procedure.

There are numerous ways of freezing purees for use as frozen desserts. Most of these products are very attractive and the possibilities for combining fruits of different flavours are enormous. The W.R.R.L. has developed a pectinised puree which is called "Velva Fruit." A product of this kind would have its main value in providing an outlet for surplus or slightly over-ripe fruit.

Cold Packing of Fruits.

It has already been mentioned that the modern practice of freezing fruits in small containers has arisen out of the older-established "cold packing" in barrels.

"Cold packing" and "frozen packing" are the names applied to the bulk freezing of whole berry fruits, sliced peaches, sour cherries, etc. Originally, much of this packing was done without added sugar. At present, most of the fruit is packed with dry sugar added.

The cold packing industry still accounts for the great bulk of the frozen fruit output. The procedure is fairly simple and is similar to that described for individual fruits under the headings above. The inspection and care in processing should be just as important with bulk frozen as with fruits frozen in retail containers.

The institutional containers range from 10 lb. cans to 50 gallon barrels. The 30 lb. can with slip-cover lid is a popular container for most fruits. There is a tendency for more packing in large cartons lined with parchment or cellophane bags.

Usually the freezing of cold packed fruit is strictly "sharp freezing," *i.e.*, it is carried out in a room at a temperature of anything from 5 deg. Fahr. to minus 20 deg. Fahr. The tendency in recent years has been towards lower temperatures (minus 20 deg. Fahr.) with the provision of fans for increasing air circulation and thereby the rapidity of freezing. Many plants partly freeze 30 lb. packs in a quick freezing tunnel and the freezing is completed in the storage room at 0 deg. Fahr. or lower.

(To be continued.)

Increasing Dairying Efficiency.

"THE services of my Department are entirely at the disposal of the dairying industry to improve its efficiency," said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), in officially opening the Annual Conference of the Dairy Factory Managers and Secretaries' Association on 24th May. "In view of the increasing demand for dairy products, both locally and overseas, I would advise dairy farmers to adopt sound practices by improving breeding and feeding methods."

There was still great scope for increasing efficiency within the industry, said Mr. Graham, and breeding methods in dairy herds should have first priority.

At the present time, New South Wales had too many dairy herds headed by scrub bulls. In New Zealand, there had been startling improvements in herd production with proven sires and the New South Wales Department of Agriculture now had plans for adopting this method of breeding.

"A recent significant development in the dairy industry," said Mr. Graham, "is the manufacture of butter direct from milk. My Department has been associated with these trials and expert officers consider that the process may eventually have definite application to the industry."

Insect Pests—*continued from page* 308.

The D.D.T. spray is used at a concentration of 0.1 per cent. =

D.D.T. emulsion (20 per cent.), 3 fluid oz.

Water, 4 gallons.

The dust contains 2 per cent. D.D.T.

The lead arsenate spray consists of:—

Lead arsenate powder, 4 oz.

Water, 4 gallons.

and the dust consists of the following mixture:—

Lead arsenate powder, 4 oz.

Kaolin, 1 lb.

Where infestation occurs amongst plants such as lettuce, spinach, etc., *which must not be contaminated with D.D.T. or lead arsenate residues, either the poisoned foliage, or poison bran bait must be used.*

CONTROL OF BACTERIOPHAGE
In Cheese Manufacture.
BY THE ROTATIONAL USE OF SINGLE STRAIN STARTERS.

W. S. SUTTON, B.Sc.Agr., A.A.C.I., Senior Biologist, and A. B. SHELTON, Special Dairy Officer.

MAINLY as the result of research by Whitehead, Hunter and co-workers in New Zealand, a technique which is very effective in preventing starter failure due to bacteriophage is available to cheesemakers. Methods employed have been modified in minor degree to suit various local conditions, but all aim essentially at the same end, viz., the prevention of contamination of the bulk starter by bacteriophage, particularly air-borne bacteriophage.

Origin of Bacteriophage.

Where bacteriophage originates is obscure. Some believe it may remain inactive in a culture and "flare up" when conditions particularly favour it. Others think it may arise spontaneously as the result of some abnormal change in one or more of the millions of cells which constitute a starter. Others, again, believe that it exists in soil or faeces, attacking bacteria which live in those media, and is first introduced to the starter as a chance contaminant.

But whatever the basic origin of the phage it can be accepted, without reserve, that by far the greatest number of starter failures result directly from contamination of the culture by phage which has developed, from pre-existing phage, in the cheese vat within the preceding two or three days.

Sources of Phage Contamination.

Bacteriophage multiplies only within the cells of the starter organism which it causes to disintegrate (Fig. 1), and is thus liberated to attack further cells. So, in a cheese factory, phage is to be found in greatest concentration in the bulk starter or in the cheese vat where it is attacking starter. It is from the vat that the phage, by devious means, gains access to the starter at a stage sufficiently early, or in concentration sufficiently great, to cause starter failure.

Vat-generated phage is capable of finding its way into starter by several routes.

(1) If methods of factory sanitation are insufficiently rigorous the phage will live over in the vat or on the knives, rakes, etc., from day to day and will attack the starter immediately it comes into contact with the cheesemaking utensils.

(2) Because whey is often distributed to farmers, for use as pig or calf food, in the milk cans, and methods of can sterilization on the farms are not always effective, phage is frequently returned to the factory in the milk supply.

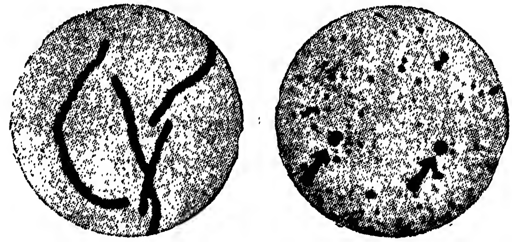

Fig. 1.—Micro Photographs showing the Disintegration of Starter Cells by Bacteriophage.

(A) An actively growing "starter" showing long chains of *Streptococcus cremoris.*

(B) The same starter 2 hours later. Bacteriophage has destroyed all but a few isolated cells.

(3) Phage is carried into the air in small droplets of whey which rapidly dry out and continue to be air-borne in the form of minute whey-dust particles. This air-borne phage rains down on to the vats or, more serious still, gains entry to starter propagation flasks or bulk starter cans.

(4) The starter maker may carry phage from the cheesemaking room to the starter room on his hands or clothing, and particles of phage may enter the starter during the sub-culturing process.

(5) The common practice of removing cheeses from their hoops and balancing them

on the sides of the "making" vats permits phage-containing whey particles to enter the vats during the early stages of manufacture.

Why Phage Contamination is Serious.

It is impossible to produce milk or to handle milk at the cheese factory without contaminating it to some extent with "foreign" bacteria. But if methods of production and manufacture are efficient the comparatively small numbers of contaminants are outnumbered and suppressed by the starter organisms and thus have little if any adverse effect on cheese quality.

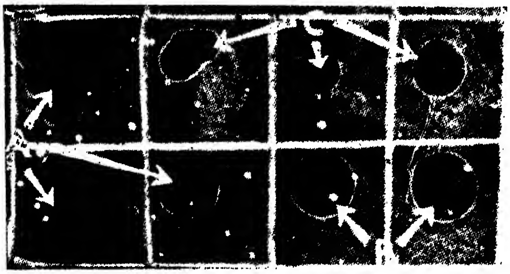

Fig. 2.—Disintegration of Cells of *Streptococcus cremoris* on the Surface of Agar by Bacteriophage.

The circular areas in the various squares show where droplets of whey have been deposited. In circles indicated by arrows from "A" the whey contained sufficient phage to disintegrate all the cells and thus to give a perfectly clear area. Arrows from "B" indicate wheys which contained only a small amount of phage, and the cleared zones were only minute. Arrows from "C" indicate wheys which were free from phage and therefore permitted normal growth of the "starter."

The white circular spots are colonies of contaminating bacteria. Note that they are not destroyed by the streptococcal phage.

But phage works in a manner entirely different from bacteria. Whereas bacteria compete with the starter streptococci for the food in the milk, the starter streptococci are the food of the phage and large quantities of starter thus exert no inhibitary effect on the activity of the phage.

The starter organisms carry out their acid-producing function until they are destroyed by the phage, and the presence of small numbers of phage units does not noticeably reduce the rate of starter activity. However, when a few units of phage have destroyed a few starter cells, these units, which have multiplied more rapidly than the starter cells, are freed to attack new and greater numbers of streptococci. Thus after a few generations there is enough phage to destroy all starter cells. It is for this reason that bulk starter which has been contaminated by a very few phage particles at the time of inoculation is completely destroyed by the time that the cheesemaking process is partially completed. When contamination is heavier, the bulk starter itself may fail to set.

While minor contamination in the bulk starter may cause total failure in the vat, slight contamination in the vat is unimportant because the work of the starter is finished before the phage has multiplied to the degree where it seriously interferes with acid production. Nevertheless all equipment should be sterilized before use to reduce the possibility of dangerous contamination.

Effect of Phage on Different Strains of Starter.

There are two species of bacteria which could be used successfully as pure strain starters. These are *Streptococcus lactis* and *Streptococcus cremoris.* In New South Wales the latter species only is distributed by the Department of Agriculture because control of phage is easier with *S. cremoris* than with *S. lactis.*

In nature there exist numerous strains of *Streptococcus cremoris* and, possibly, just as many strains of the bacteriophage which attacks the species. However, the bacteriophage which destroys one starter strain is often incapable of attacking many of the other strains. It is because of this fact that a factory which is experiencing trouble with one starter can change to a second one and obtain immediate success. It is also this fact which results, on the one hand, in comparatively few complete failures in mixed culture starters and, on the other hand, in the irregular results obtained from day to day when a mixed starter is used.

In the same way the bacteriophage active against a given starter is incapable of destroying cells of contaminating bacteria (Fig. 2).

Control of Phage.

The methods of factory practice which have been designed to control phage have been planned to eliminate, as far as possible, the sources of contamination listed above. Each aspect is treated separately hereunder.

Factory Sanitation.—Bacteriophage is "soluble" in water and therefore much of it can be washed away. The first requisite in cleaning up is to place knives, rakes, agitators, etc., in the vat and to hose them down

thoroughly with water at a temperature of 100 to 110 deg. Fahr. Care should be taken to dislodge, mechanically if necessary, any particles of curd adhering to the equipment. The vat drain cock should then be closed and the equipment, including the sides of the vat, thoroughly brushed with a solution containing 1 volume of hypochlorite to 200 volumes of water. A detergent may be used in this solution.

The more thoroughly milk, whey and curd particles are removed from the manufacturing room the more effective is the removal of phage.

Because of the build-up of phage while a starter is working in a vat, the practice of double shifts is extremely dangerous. Even though the vats, etc., are carefully "sterilized" between shifts, the accumulation of phage in the air with a subsequent

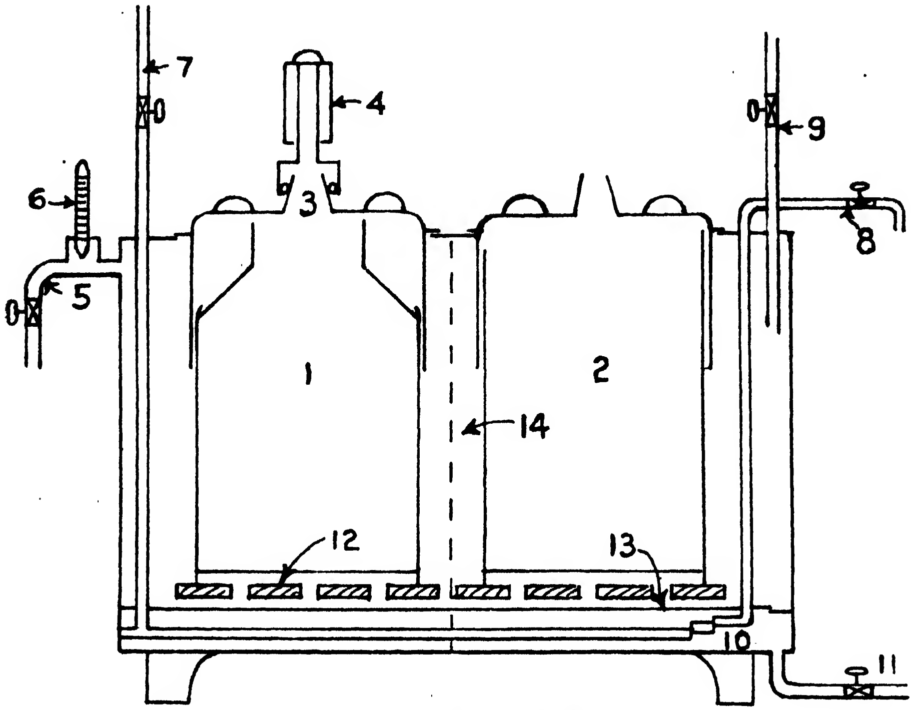

Fig. 3.—Section of Bulk Starter Preparation Cabinet.

1. Starter can of 10 gallons standard transport type.
2. Alternative type of starter can with straight sides.
3. Tapered inlet to water seal lid having external diameter of inlet 2¼ inches at its base, rising to 2 inches external diameter at top rim.
4. Air filter, detail of which is shown in separate drawing. Filter slides on to the tapered inlet to water seal lid until the rubber ring at the base of the filter contacts the side of inlet and the rim of the inlet embeds itself in a cotton wool pad inserted in the base of the filter.
5. Overflow pipe from cabinet to regulate water height. Also shows position of toe piece to hold thermometer.
6. Thermometer to register temperature of water when boiling and temperature of water circulated for cooling purposes.
7. Steam service ¾-inch pipe leading to heating coil at bottom of cabinet.
8. Exit pipe from steam coil showing steam trap.
9. Water service 1-inch pipe to deliver water into cabinet near top for filling cabinet to overflow level.
10. Steam coil showing return end of coil laying lengthways along bottom of cabinet.
11. Draining outlet and tap.
12. Wood or metal grating.
13. Rest bars for grating supported on angle-iron brackets on internal walls of each section of cabinet.
14. Perforated section division walls to support cover of cabinet and keep cans in position.

The hypochlorite solution, when run from the vat, should be used for swabbing the floor and whey drain. A second hypochlorite treatment should be given immediately prior to each day's manufacture.

"phage-rain" into the vat may sometimes cause trouble. If it is practically possible double shifts should be avoided as they permit the development of phage to an extent which is dangerous to the starter in the later

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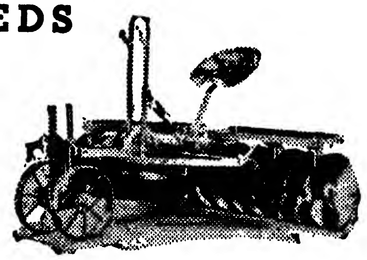

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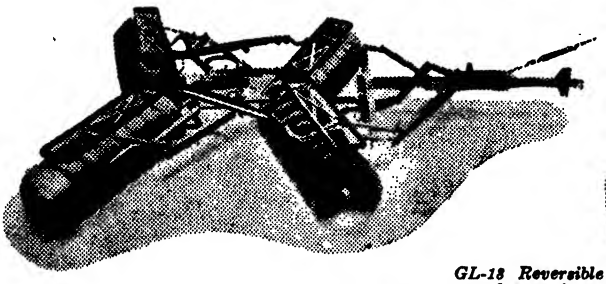

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vats. Double shifts also interfere with the rotational use of starters described below.

Contamination from Milk.—The methylene blue test gives some indication of the

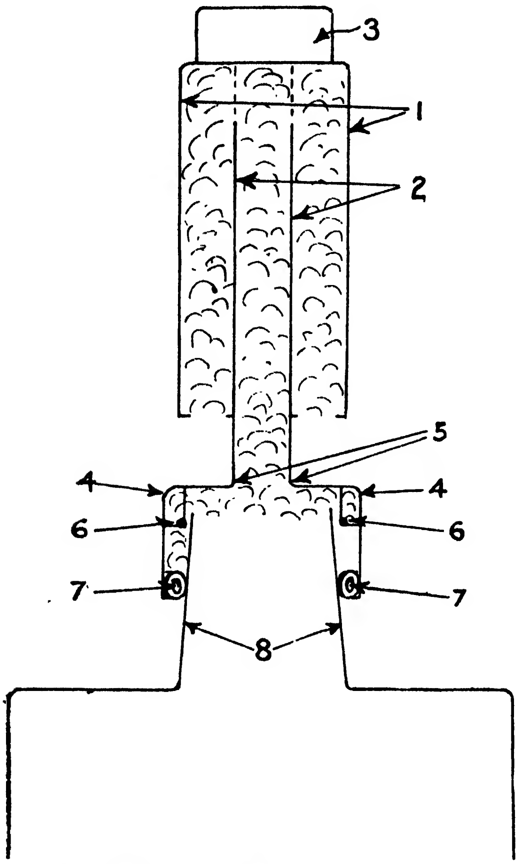

Fig. 4.—Section of Air Filter used on Bulk Starter Can.

1. Walls of tube having internal diameter 2½ inches and length 5 inches with sealed top.
2. Walls of tube having internal diameter ¾ inch and length 6 inches, and a series of ⅛ inch holes in the top half-inch of the tube wall above which the tube is spot welded to the under-surface of the sealed top of the large tube, and at bottom is welded into a ¾ inch hole in the base of the filter.
3. Strap handle raised ½ inch and 1½ inch in length.
4. Short tube which forms base of filter having diameter 2½ inches and depth 1⅝ inch.
5. Junction of filter and base tube completely sealed by welding.
6. Wire ring suspended by three wires at position ¼ inch from top of base tube and held at position ¼ inch from wall of base tube by three wires.
7. Rubber ring ⅜ inch in thickness inserted in a groove ¼ inch depth and ⅜ inch width, which forms the bottom edge of filter base.
8. Tapered inlet to water seal lid of starter can. Base of inlet where welded into the can lid to be 2½ inches in external diameter tapering to 2 inches external diameter at the top.

general cleanliness of the farmer, and standards of milk quality, as indicated by the test, should be strictly enforced. Such action would compel the farmer to sterilize his utensils more effectively and thus reduce the phage content of his milk.

The use of pure strain starters, in series, is an excellent method of minimising the trouble experienced from phage contaminated milk.

Air-borne Phage.—Ventilation reduces the phage content of factory air by dilution. What is blown away is no longer a source of danger. However, some phage always remains in the air and the most serious contamination, that of the mother starter or bulk starter, cannot be avoided unless the phage is excluded from the starter by mechanical means. For this reason, all air which gains entry to tubes, flasks or cans must be sterilized.

As far as tubes and flasks are concerned, by far the most satisfactory method of starter propagation is to carry out the work in a building completely isolated from the factory; in extreme cases the home of the starter maker may be used. Bulk starter may be made in the factory, preferably in a room isolated from the manufacturing vats, provided that the equipment consists of a can fitted with a water-seal lid (Fig. 3) which, in its turn, is fitted with an air filter (Fig 4). A U-shaped steam distribution rose must be ejecting steam around the inoculation aperture before the air filter is removed for the purpose of adding the starter to the can.

Five main features are essential in using the above equipment—

1. The water in the sterilization vat must be sufficiently high to form a perfect air occluding seal.
2. The cotton wool in the air filter must be kept dry. If slightly damped by condensed water, it may be dried out, without dismantling the filter, in the boiler room. One charge of cotton wool will last six months or longer. The small pad of wool which has contact with the inoculation aperture should be changed more frequently.
3. The rubber sleeve junction between the filter and the lid of the can must be absolutely airtight.
4. The inoculum is merely poured into the can. Stirring is unnecessary and would result in certain contamination with phage, thus nullifying all other

precautions. In fact the water sealed lid must not be lifted at any stage.

5. All inoculations must be made in the absolute minimum of time.

The Use of Pure Strain Starters.

It is possible to carry on with a single starter for long periods if all the above precautions are taken. However, by changing the starter used each day the danger of phage accumulation in the factory is greatly minimised. For this purpose each starter must be a pure, single strain culture; the use of a mixed culture would defeat the whole purpose of the scheme.

There is available to cheesemakers a series of eight pure strain cultures, each of which is immune to the bacteriophage of each of the seven other strains. For convenience of handling, these starters have been numbered serially from one to eight. The cultures are supplied by the Chief Biologist, Department of Agriculture, Box 36A, G.P.O., Sydney.

When received at a factory, they should be set out in a single row in test tubes in a rack. They should be sub-cultured from tube to tube daily and into flasks, etc., as indicated in the table.

There should be no deviation from the orderly sequence outlined in the table, as this rotation has been designed to reduce the possibility of phage contamination from milk, air and utensils to a minimum.

PROGRAMME OF SUB-CULTURING.

	Sub-culture into Flasks.	Sub-culture into Bulk.	Use in Vats.
1st day	No. 1 No. 2	....	....
2nd day	No. 3 No. 4	No. 1 No. 2	....
3rd day	No. 5 No. 6	No. 3 No. 4	No. 1 No. 2
4th day	No. 7 No. 8	No. 5 No. 6	No. 3 No. 4
5th day	No. 1 No. 2	No. 7 No. 8	No. 5 No. 6
6th day	No. 3 No. 4	No. 1 No. 2	No. 7 No. 8
7th day, etc. ...	Repeat the series 3rd day to 6th day (inclusive).		

Each pure strain should be grown as a single culture in the tubes, flasks and cans, but when used in the vats, each pair of starters should be used as a mixed culture, *i.e.* on the third day cultures No. 1 and No. 2 should be used as a 50:50 mixture in each vat; and on the fourth, fifth and sixth days the starter should be a mixture of cultures 3 and 4, 5 and 6, and 7 and 8 respectively.

Deputy Principal Appointed at Hawkesbury Agricultural College.

THE appointment of Mr. H. R. Richardson, B.Sc. Agr., as Deputy Principal of Hawkesbury Agricultural College has been announced by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.).

Since his return to Australia and discharge from the Army, until his present appointment, Mr. Richardson has been engaged in assisting the Principal Agronomist (Pastures) in all aspects of pasture work.

Mr. Richardson is thirty-two years of age, and entered the Department in 1937 as Assistant Plant Breeder. When stationed at Grafton Experiment Farm, Mr. Richardson produced hybrid maize combinations considerably superior in yield to existing varieties and carried out an improvement-by-breeding programme of a wide range of other crops, including sorghum, sugar cane, legumes and grasses, and had gained an intimate knowledge of North Coast pasture conditions.

Mr. Richardson served overseas with the A.I.F. in Ceylon, Palestine, Egypt, Libya, Lebanon, Syria and Greece. He was taken prisoner-of-war at El Alamein. After liberation by the American Army in 1945, he was selected as an Empire speaker, and was granted educational leave from the Army to undertake a special study for the Department, of all phases of pasture investigations being carried out in Great Britain, Eire, Eastern Canada and the United States.

Mr. Graham said that he had every confidence that Mr. Richardson's extensive knowledge and wide experience of agricultural problems both in Australia and abroad fitted him admirably for his new appointment as Deputy Principal at Hawkesbury Agricultural College.

RUGGING of cows during cold weather is well worth while. Where proper protection is not provided for dairy cows, not only is their resistance to disease reduced, but much food material is wasted. A cow's food is only devoted to production after the animal has satisfied its need for nourishment and heat.

The farmer can make his own cow rugs for little more than the cost of the bags, a ball of twine, and a sewing needle—plus his own ingenuity. Two cornsacks or heavy bags (or three for larger cows) will make a good rug.

THE BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics

THE DOLLAR SITUATION.

Effects on Australian Agriculture.

THE *current dollar shortage is not restricted to Australia or to the British Empire. Most countries of Europe and Asia are affected by it to a greater or lesser degree. The fundamental cause of this shortage is to be found in the fact that the American continent, and the United States in particular, increased material production during the war years whilst most countries in Europe and Asia suffered severely from the physical ravages of war.*

This meant that Britain, France and other European countries could not produce enough goods for export to finance those imports of materials such as foodstuffs, raw materials and machinery, which were essential to re-equip and resume peace-time production. After the war, America became by far the greatest exporter of those goods normally sold in peace-time international trade.

The Australian shortage of dollars and other "hard" currencies is not due to any decline of production caused by war, but is due to the fact that we are not able to obtain dollars from other countries (especially Britain) in exchange for our exports—as we could before the war. Australia has never been self-sufficient in dollars; that is, we have always imported more from the United States than we exported to that country.

Efforts Being Made to Reduce the Dollar Shortage.

In order to reduce our demand for dollars and to help solve Britain's dollar problem, all current Australian gold production will be sold in Britain, the import of luxury goods from dollar areas has been prohibited, drastic cuts have been made in imports of other commodities such as newsprint, tobacco, motor cars, petrol and films, and efforts are being made to expand secondary industries in those directions which will assist in earning dollars. Nevertheless, the Australian deficit between dollar earnings and expenditure during the current financial year is expected to be about £A forty-six million. If current restrictions on imports are maintained and there is no increase in our exports to dollar countries, the dollar deficit next year (1948-49) is expected to be about £A twenty million.

Influence of Dollar Deficit on Australian Farming.

What influence has this dollar deficit on Australian farmers? In the first place it affects farmers like most other citizens, insofar as they cannot buy "luxury" items formerly imported from the United States. Tobacco and cigarettes are scarce and American motor cars are only available in limited quantities. In the future, if the dollar shortage should continue, it will

affect Australian imports of farm machinery to a greater extent than at present. At the present time many items of agricultural machinery are in short supply, not because the Australian authorities restrict imports, but because only 15 per cent. of American production is allowed to leave that country—so that exports to Australia are only a fraction of the pre-war volume. The shortage of tractors, for instance, is not confined to Australia; in the United States, according to a recent survey, farmers would buy 1,200,000 tractors if they were available. United States tractor production in 1947 was about 450,000 units, but present capacity is about 800,000 units per annum.

Effect on Our Export Trade.

What effect the dollar shortage will have on Australian agricultural exports is doubtful. A lot will depend on the outcome of current measures taken by the United States, such as the Marshall plan, to stimulate recovery in Western Europe. The immediate effect of the Marshall plan is, of course, to supply Britain and Western Europe with a certain amount of dollars which these countries would otherwise not have. However, the long term effects will be of far greater importance.

If the Marshall plan promotes European and British recovery, it is likely that world trade will increase and that these countries will be able to purchase larger quantities of primary products, grains, meat, sugar, fruit, etc., from abroad than in the pre-war decade. Indeed, in order to maintain the pre-war standard of living, let alone increase it, these countries will have to increase their imports of foodstuffs, as there has been a substantial increase in population in Western Europe and Britain since 1939.

Whether European recovery will occur in the manner expected under the Marshall Plan is not at all certain; the progress made to the end of 1947 in rebuilding the economies of most of these countries was far from satisfactory. If agricultural and industrial production in these countries does not increase sufficiently, or if a slump in the United States prevents an expansion of exports, Britain and Western Europe may be forced to restrict imports and resort to exchange control and bi-lateral trade. This would lead to a continuation and intensification of "currency blocs" of the kind which emerged in the years before the recent war.

For the Australian farming community this would have far reaching detrimental effects as a large part of the two most important Australian primary products, namely wool and wheat has to be sold outside the sterling area. If bi-lateral trade becomes the order of the day we may experience difficulty in finding markets for those products, of which there is a net export balance from the sterling area. Furthermore, in this case, the dollar scarcity would remain a permanent feature of our economy.

Australia is Interested in European Recovery.

It is, of course, hard to predict just how far production will be stepped up in Western Europe, but there can be little doubt that Australia is interested in European recovery. Only if employment and production are kept on a high level abroad will we find it easy to market our surplus of primary products abroad. It is true that temporary misfortunes and the devastation caused by war in the European economy have worked towards the advantage of Australia, since our products are in such great demand abroad, largely as a result of these influences, but in the long run the Australian farming community can only prosper when the peoples in other countries have the wherewithal to buy our produce, and this implies rising living standards in those countries with which we trade.—F. H. GRUEN, Economics Research Officer.

TUNG NUTS.

TUNG production has not flourished as well as it could in New South Wales for many reasons, but the potential value of the industry is so great that strenuous efforts to reorganise it on sound economic lines would be well worth while.

The tung nut tree is extraordinarily well suited to the north coast of New South Wales and further efforts should be made to expand production there.

Tung nuts are used to obtain tung oil, which has some very unusual qualities and is much sought after as a drying oil by the paint and varnish industry. Before the war, Australia imported about 1,000 tons of tung

oil annually, mostly from China. Since 1941-42 only a small fraction of this quantity has been available.

The first plantings of tung nuts took place in New South Wales in 1926, but until 1941-42, only 922 acres were recorded. Production of tung nuts in New South Wales has been virtually stationary for many years, oil production being 5 to 8 tons annually.

Difficulties to be Overcome.

A number of factors have been responsible for retarding this industry in the past. Indiscriminate planting has taken place in many cases. High-yielding strains are now available and the most suitable districts and locations can be well defined, so that these factors should no longer hamper development. Shortage of labour has, in the past, made the collection of nuts difficult. To overcome this particular difficulty a mechanical picking-up machine is now being developed by the Museum of Technology and Applied Science.

Two further difficulties which seem to stand in the way of increased activity in the industry are the high cost of transport of individual lots to Sydney and the fact that there is no buying competition. The one firm in the market does not offer growers very attractive terms. One solution to both these problems would be the establishment of an oil-mill by a co-operative on the north coast. However, this would be advisable only if tung production were expanded considerably at the same time. Perhaps a more practical immediate step which could be taken would be the formation of an association of growers which might be able to obtain more attractive terms from other oil-crushing mills in Sydney and also arrange for transport of tung nuts in bulk to Sydney.

The Demand for Drying Oils.

Based on the pre-war import figures there is an annual demand for at least 1,000 tons of tung oil in Australia, and this amount is certainly on the conservative side in the light of the present demand for drying oils. Furthermore the market for tung oil would not be restricted to local requirements, as the tung industry has suffered a severe set back in China as a result of damage to tung nut trees during the Japanese occupation. China was the largest exporter of tung oil pre-war. The market for tung oil in the United States, the largest importer of tung oil, seems to be expanding. The only country where large plantings of tung have taken place in recent years is Argentina.

The north coast of New South Wales, where this tree could be grown best, is at present relying on butter production for a large part of its agricultural income. Tung oil could provide a welcome supplementary source of income in this area.—F. H. GRUEN, Economics Research Officer.

MEAT INDUSTRY TRENDS.

MEAT is one of the most important primary products in which Australia has a large international trade. As is the case with most other commodities the demand for meat and meat products is far greater than the present world supply, with the result that all Australian meat exports, whether in the form of beef, mutton, lamb or pork, have a ready market.

This demand from overseas for Australian meat is likely to remain keen for many years. In addition to the established markets, developments may reasonably be expected in the East where increased industrialisation, higher wages and more spending power may stimulate the consumption of meat of all classes. Furthermore, as a result of the recent tariff agreement signed after the International Trade Conference at Geneva, Australia has secured considerable reduction in the American tariffs against foreign imports of meat. The import duty on lamb has been reduced from 7 cents to 3½ cents per lb. and means a reduction in the landed cost of approximately 2⅝d. per lb. The United States duty on mutton is reduced from 5 cents to 2½ cents per lb. The duty on beef and veal has been cut from 6 cents to 3 cents per lb. These valuable concessions should prove a useful standby when the present contracts with Great Britain are completed, should no large-scale renewal take place.

Domestic Consumption.

Within Australia, the expanding population is having a marked effect on the local use of lamb and mutton as well as beef. In the five years 1939 to 1943, New South Wales alone shipped 1,600,000 carcases of lamb per year to Great Britain. In 1946, the total was only 516,000. In spite of rationing domestic consumption of meat per head continues to remain at a high level.

Domestic Prices.

Domestic meat prices have continued to rise steadily and the market for lamb, in particular, is at present fluctuating as a result of the lifting of price control for this class of meat. The export price index based on the three years ended June, 1939, has risen from 1,022 in June, 1940, to 1,092 in June, 1942, 1,122 in June, 1943, 1,132 in June, 1944, 1,218 in June, 1945, 1,234 in June, 1946, 1,393 in June, 1947, and from July, 1947 to February, 1948, has stayed constant at the index figure 1,446.

New South Wales Production.

Beef and veal production in New South Wales declined from a pre-war average of over 182,000 tons per year to about 142,000 tons in 1947. In the last six months of 1947 beef production stood at over 70,000 tons, veal over 6,000 tons, mutton over 34,000 tons, lamb over 25,000 tons and pork over 8,000 tons. So far this year beef production is some 24 to 28 per cent. higher than for the corresponding period in 1947. Mutton and lamb production, however, is some 22 to 25 per cent. lower, while pig production so far this year has remained about the same as for a similar period in 1947.

Australian Production in Recent Years.

The main trends in the production of each type of meat may be summarised as follows:—

Beef and Veal.

Total Australian production of beef and veal in tons for the last three financial years is as follows:—

Year	Beef	Veal	Total
1944/45	429,600	31,500	461,100
1945/46 (a)	382,300	24,300	406,600
1946/47 (a)	456,800	29,100	485,900

(a) Preliminary.

The recession of 1945/46 proved temporary and the production for 1946/47 was expected to be greater than in 1944/45, which was a good year.

In New South Wales, for the twelve months ended December, 1947, production of beef and veal was about 10 per cent. higher than for the calendar year 1946. This trend has continued into the first three months of 1948. There is evidence that the output of beef will not improve to any great extent on the present figures, particularly in the case of dairy cattle used for meat. The present peak is partly the result of favourable weather conditions allowing the growth of suitable feed.

Mutton and Lamb.

Total Australian production of mutton and lamb in tons for the last three financial years is as follows:—

Year	Mutton	Lamb	Total
1944/45	257,200	138,200	395,400
1945/46 (a)	197,800	92,900	290,700
1946/47 (a)	187,600	120,300	307,900

(a) Preliminary.

A marked downward trend is indicated in the production of mutton. Production of lamb has also fallen considerably in spite of what seemed to be a temporary uplift at the end of 1946-47.

In New South Wales, for the twelve months ended December, 1947, production of mutton and lamb was almost eight per cent. lower than for the calendar year 1946. For the first three months of 1948, the downward trend of production has steadied.

The numbers of fat stock being marketed are lower than normal. This seems to be due to a combination of factors, most important of which are, the availability of suitable feed and the incentive to hold the stock until it is possible to secure another wool clip. The high prices being obtained for wool have made store stock expensive. Furthermore, owners are using their natural increase of stock to build up flocks to the normal carrying capacity of their holdings, making up for losses experienced in the drought years. Future trends in production will depend on the comparative export prices of meat and wool.

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Pigmeats.

Total Australian production of pigmeats in tons for the last three financial years is as follows:—

Year	Pork (b)	Bacon & Ham (c)
1944/45	42,570	56,290
1945/46 (a)	34,576	47,961
1946/47 (a)	31,036	46,092

(a) Preliminary. (b) Carcase weight. (c) Cured weight.

A clear decline in the production of both pork and bacon is indicated, being greater in the case of pork.

In New South Wales, for the twelve months ended December, 1947, production of pigmeats was about 5 per cent. lower than for the calendar year 1946. In the first three months of this year an improvement is indicated.

The pig industry had a difficult time during the drought period, which materially reduced feed supplies. The consequent decline in pig numbers was the direct cause of the decline of pigmeat production. The return of good seasonal conditions has not been accompanied by any general large-scale improvement in production. Price movements have not satisfied growers who are awaiting the terms of the agreement to be made with Great Britain. Other difficulties are the shortages of labour and materials and the availability of feed wheat at a suitable price to growers.—J. B. MAYNE, Economics Research Officer.

Selling Lice-Infested Sheep an Offence under the Stock Diseases Act.

A DEALER who has repeatedly offered lice-infested sheep for sale was prosecuted last month for selling lousy sheep at the Flemington Saleyards, and was fined £50.

It is the responsibility of this Department to administer the regulations under the Stock Diseases Act, which include measures for control of lice and ked infestation in sheep. Whilst in most cases the Department desires and does obtain the co-operation of stockowners in the control of these parasites, it has no alternative but to prosecute persons who flout the regulations.—W. L. HINDMARSH, Chief, Division of Animal Industry.

Approved Vegetable Seed—June, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Varieties Listed—continued.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, "Sherwood Farm," Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Hunter River Brown—R. C. Morandini, Box 74, Dubbo.

Pumpkin—

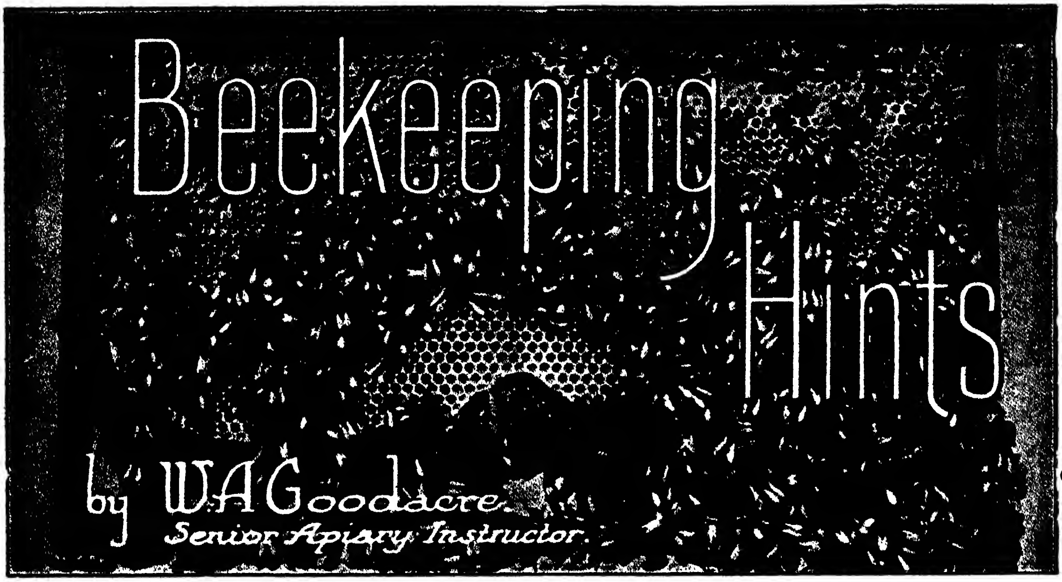
Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.



AIR TRANSPORT OF BEES

Over Long Distances.

SOME RECENT EXPERIENCES.

THE transport of queen bees by air mail over long distances to and from this State has been carried out successfully during the past year. A consignment of queens and escort was successfully sent by the Department to Russia (one was also sent the previous year) and two lots of nucleus colonies of bees were despatched to Indo-China.

Thirty queen bees came to New South Wales by air from the United States of America without a single loss, but, unfortunately, some Grey Caucasian queens sent to the Department from Russia died during the trip.

Bees imported from oversea countries to New South Wales (in cages containing queen bees and worker escorts) must be forwarded to the Chief Quarantine Officer (Animals) of this Department. During the examination for disease and the changing over of each queen to a fresh escort in a new cage, an excellent opportunity is provided to observe the conditions of the bees on arrival and the different types of cages used.

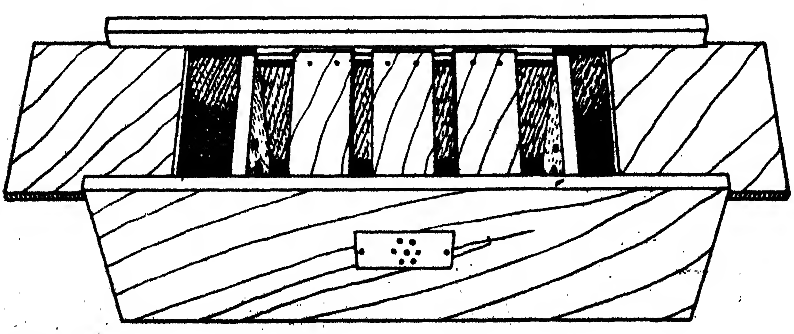


Fig. 1.—Diagram of the Cage in which Italian Queen Bees and Escorts were sent by Air Mail to Russia.

The full length top cover is not shown in order that the details of construction may be seen. Note the food chambers at the ends and the three short frames across the centre compartment.

Successful Consignments to Russia.

The Department has been successful in transporting two consignments of queen bees to Russia, one in 1946 and one in 1947, using the type of cage shown in Fig. 1. This cage is 6 inches long x 2 inches wide x 2 inches deep and was described in the December, 1946, *Agricultural Gazette,* in which issue details were also given of the methods used when despatching these bees to Russia.

The use of a large cage to house the queen and about eighty escort bees was desirable in these instances, because it was necessary to forward the bees during our winter so that they would arrive in Russia at a favourable time, and also to guard against the risk of any undue delay en route. Both consignments were from Hawkesbury Agricultural College, and the Department of External Affairs, Canberra, arranged air transport and delivery to the Scientific Institute of Bee Culture situated near Moscow, U.S.S.R.

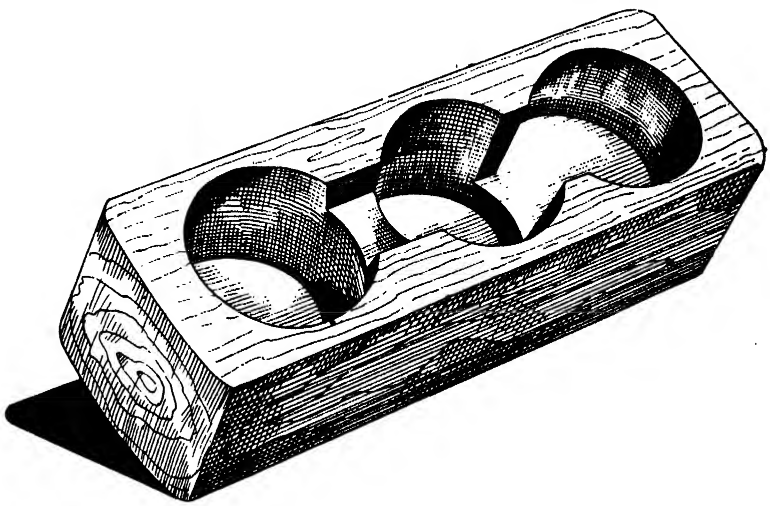


Fig. 2.—Sketch of Russian Bee Transport Cage.
Note the opening to the candy compartment (on the left) and the shallower clustering compartment on the right.

The Russian Transport Cage.

In exchange for the queen bees despatched from Australia, the Director of the Scientific Institute recently forwarded a consignment of three Grey Caucasians from his country, but unfortunately the bees did not survive the trip over. However, the design of the transport cage used, which is different to any seen previously in this country, is of particular interest. A sketch of it is given in Fig. 2.

It will be observed that the cage has three large circular compartments. The food compartment, which was about three parts filled with candy, is shown on the left-hand side; an opening ⅜ inch deep and nearly 1 inch wide provided a passageway to enable the bees to reach the food supply from their clustering space in the two adjoining compartments.

An interesting feature in connection with these two clustering compartments is that the floor of the one on the end (on the right) is raised ⅜ inch above the centre one. This would guard against trouble should the candy run a little if the cages were exposed to extremely hot climatic conditions. The queen and her escorts would then be able to cluster in the higher and dry outer compartment. The over-all measurements of the Russian cage were: length 7 inches, width 2¼ inches and depth 2 inches.

Small Cage Used by U.S.A. Bee Breeders.

Thirty queen bees came through from the United States of America by air mail during the past year without a single loss. The air mail service from U.S.A. is more direct than from most other countries, and the time between despatch of the cages from the various apiaries and arrived in New South Wales might not exceed four days.

Following some experimental work with slightly larger cages, most U.S.A. exporters of queen bees now use the very small type

three-compartment cage illustrated in Fig. 3. The over-all measurements of the cage are 3½ inches long by 1 inch wide by ⅝ inch in depth.

A hole is bored through each end of the cage. The hole into the candy compartment is used in U.S.A. for introduction of the queen. The other facilitates the placing of the bees in the cage and provides ventilation. United States' bee breeders appear to take no risk of loss from this cause. A shallow groove runs along each side of the cage, and opposite the compartment farthest from the candy supply this groove is cut right through, to provide additional ventilation.

Thin staples, somewhat similar to those made for fastening papers together, are used to secure the covering wire screen and label, and also to pin cages together where the consignment consists of a number of cages.

One such staple is shown in Fig. 3.

No more than nine escort worker bees are placed with a queen in each of these small cages.

Nucleus Colonies Sent to Indo-China.

The Department has also been successful in sending nucleus hives of bees by air to Indo-China. The first stage of the journey was to Singapore, and then on to Saigon in Indo-China. From Saigon the colonies were transported about 100 miles over a very rough road to their destination. This was a very severe test in long distance transport.

The first three colonies survived and made headway. However, later in the season, birds and a particular species of wasp developed a taste for field bees (or the nectar they were carrying to the hives), and this interfered with progress for a time until the birds could be frightened away from the environment of the hives and nearby wasp nests destroyed.

To allow of firm establishment of honey bees in Indo-China, a further consignment of two five-frame nucleus hives was forwarded recently from Hawkesbury Agricultural College. To-date no information concerning the condition of the bees on arrival has been received. Both consignments to Indo-China were arranged by the Australian Trade Commission through the Commonwealth Department of Agriculture and Commerce.

Preparation of Oversea Consignments.

The Department only makes arrangements to forward bees to overseas countries in special cases, and for experiment work in air transport. The reason for this limitation of exports is the difficulty experienced in meeting local requirements for queen bees and nucleus colonies from Hawkesbury Agricultural College.

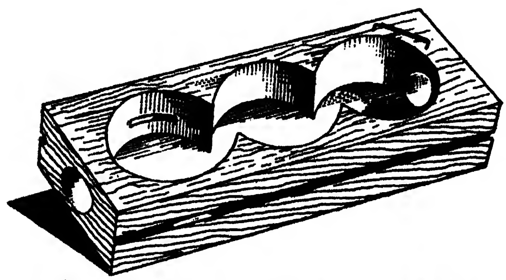


Fig. 3.—Small-type Cage used by United States Bee Breeders for Air-mail Transport of Bees.
Note the holes in the ends and the side grooves to ensure ventilation.

The selection of worker escort bees to accompany a queen bee when long distance transport is involved is given special attention at the College. Young workers about the age of those taking play flights are preferred. The young bees, engaged in taking in honey from open cells when the hive is disturbed, are easy to catch for placing in the cage.

Special care is also taken to provide adequate ventilation of the cages because some of the countries en route may be tropical areas with very hot and humid conditions.

The provision of ample ventilation is also essential in forwarding nucleus colonies. In these small hives too, the combs must be selected for strength. Combs with brood and stores that have been in use for some time stand up to reasonably rough handling such as may occur during transport, much better than new combs.

The cost of forwarding nucleus colonies to overseas countries is, of course, rather heavy. The freight charge on the two five-frame colonies to Singapore was £13. The freight from this station to Saigon was additional, and was arranged by the consignee.

Poultry Notes.

E. HADLINGTON, Principal Livestock Officer (Poultry).

REARING BETTER CHICKENS.

THE ultimate prosperity of a poultry farm largely depends upon the success attained in the rearing of chickens. Many poultry farmers carry on with inefficient brooding equipment and, therefore, sustain heavy losses among chickens or do not raise healthy, robust birds. The effect of this is to lower the general standard of the flock both in physique and egg production. If this continues year after year the flock becomes unprofitable, and finally the farm is placed on the market. Some newcomer then endeavours to carry on with even less chance of success unless he is able to improve the conditions under which the chickens are raised.

Some of the main faults seen in brooding systems are insufficient warmth to prevent the chickens from packing together, badly ventilated brooders, overcrowding and obstructions which prevent the chickens from moving freely at night time.

The first essential to success in rearing chickens is a brooder capable of maintaining plenty of warmth in the coldest of weather and at the same time allowing ample ventilation. Provision should also be made for a cooler zone so that the chickens can move out without obstruction if the temperature becomes uncomfortably hot.

In the case of coke-heated brooders it is essential that the heater have sufficient fuel capacity to last at least 9 to 10 hours—so that there is no danger that the fire might burn out at night. It is important that the heater should be kept going in the daytime so that the chickens can keep warm at any time when desired. Many beginners fail to realise that chickens require warmth during the day as well as at night, and this is a frequent cause of trouble. Where electric brooders are used these are frequently cut off in the daytime to save current. Any extra cost in keeping the heaters going all day will be counter-balanced by the better chickens reared.

Brooder Capacity.

Before making arrangements for the purchase of chickens or incubation of chickens on the farm, the question of brooder capacity should be carefully considered. One frequent cause of mortality in brooding chickens is over-crowding the accommodation; it is much more satisfactory to put through a smaller number of chickens and rear them well, than to overcrowd the brooders and suffer losses or poor development. This applies particularly to the later-hatched chickens.

Many newcomers into the industry do not take these factors into consideration, and they either hatch or purchase enough chickens to fill up the brooders at one time without making allowance for the growth of the chickens; this often results in an outbreak of cannibalism or general unthriftiness among the chickens. It must be realised that a brooder which is supposed to accommodate a given number of day-old chickens will only be large enough for half that number by the time the birds are six weeks old. Thus the safest plan is to fill the brooders only to within 60 per cent. of their capacity. This will allow for some losses and provide good conditions for successful rearing.

The Brooding Period.

It is becoming a fairly common practice to transfer chickens from heated brooders at four weeks of age and rear them in cold brooders for another two or three weeks. While this procedure may be satisfactory where a suitable cold brooder is provided, there are many instances where chickens are placed in most unsuitable types of cold brooders—with resultant heavy losses. In most districts in this State the weather conditions during the rearing season are such that there is an element of risk in moving chickens from the heated brooders too soon, and even if no actual mortality results, the chickens receive a set-back in development which is undesirable. Experience over many years has shown that better results are obtained by keeping chickens in heated brooders until they are six weeks old, gradually reducing the temperature so that no warmth is required after that age.

Temperatures Required.

In any type of heated brooder it is advisable to maintain a temperature of 90 to 95 degrees when the chickens are first put in, and reduce the temperature 3 or 4 degrees each week, so that at the end of six weeks they can be moved to a cosy shed without heat. Provision should be made for teaching the chickens to roost as soon as possible after their removal from the brooders. Details of suitable types of houses and methods of teaching the birds to roost are shown in a free publication, "Housing Poultry," available from the Department.

Quality of Export Eggs.

Report on Shipment to Britain.

IN view of the frequent appeals to producers to improve the quality of eggs for export, a report by Mr. W. L. Whitehall, of the Department of Commerce and Agriculture, on the condition of Australian eggs upon arrival in England will no doubt be of interest to poultry farmers. Mr. Whitehall was stationed in London for some years and had the opportunity of inspecting shipments upon arrival during the export season.

The following extracts are from an address given by Mr. Whitehall to the annual meeting of the Egg Producers' Council at Brisbane in April.

QUALITY OF EGGS IN SHELL.

In the first season of export after the war period break (1945-46), we were faced with quality and packaging troubles of considerable dimensions, and it is felt that no good purpose would be served in going into details on that year's exports. Suffice is to say that our troubles were real and very serious, and that in view of all conditions the Ministry of Food, while being very concerned, were very lenient and extremely helpful.

They, at all times, provided facilities for our inspection, and after representation, made available all the information collected by their organisation, including full details of the candling results on every shipment. This helpful co-operation continued on and still exists; as a result, the industry has been able to show progressive improvement in the past two seasons, and it is hoped that such progress will continue on until all our troubles are completely ironed out.

In the 1946-47 season the out-turn revealed a reduction in the average of rots of a shade over 50 per cent. when compared with the previous season, and a reduction in overall wastage of a like percentage.

In the 1947-48 season now nearly completed, from results to date the improvement continues—particularly in respect of quality.

It was not so much the overall percentage or average quality loss that was alarming, rather was it the presence of large numbers of rots in many cases; we often found over 100 rots in a half case, while other cases from the same establishment, often packed on the same day and some-

times by the same candler, would reveal a very satisfactory out-turn. The damage to Australia's prestige is best gauged by the fact that as the distribution was generally on a one egg per person basis, and as recandling does not take place, when a distributor received a case with a high number of rots many consumers would be in receipt of bad eggs and naturally would not be impressed with Australian eggs—and worse still would voice their views to others.

It is with considerable pleasure that I report that the incidence of high numbers of rots in individual cases has been extremely small in the year just concluding. This, I feel sure, is in no small measure due to the stand taken in the past year against washed eggs. Not that I suggest that all our quality faults are the result of washed eggs, for I am sure that particularly in the warmer months of production the influence of fertile eggs on quality is considerable. However, reverting to washed eggs I would say that all washed eggs are potential trouble. Whether we agree on this point or not is, I suggest, by the way, for our clients, the Ministry of Food, have laid it down that washed eggs are unacceptable to them, and I know that Mr. J. Peacock, Director of Eggs Division, British Ministry of Food, stood fast on this point when on his recent visit to Australia.

I assure you that the Ministry of Food did not come to this decision in any light manner. It was arrived at after considerable deliberation and with no little evidence to support it. Much work has been done on this matter in Canada and in England and all available evidence supports the Ministry's action. I think it would also be safe to say that research work so far conducted in Australia and the results of some of our cold store ventures early in the war, support the Ministry claim that the washing of eggs is detrimental to keeping quality.

As Australia's export surplus is of necessity a stored product, our attitude to the problem should be one of concentration on the production of clean eggs. This can be done. I say that with some first-hand knowledge of the high percentage of eggs that are produced clean in Ireland and considerable evidence from Canadian representatives in the United Kingdom that such is the case in Canada. I have seen very considerable quantities of eggs from both countries and it is all too obvious that their claims are justified—and what is more, the eggs are produced in a very clean condition.

I am aware that there are some, may be many, Australians who to-day think this an impossibility, but if they had witnessed what I have and listened to men in Ireland who shared the same doubts when the Department of Agriculture brought in what appeared to be very drastic regulations to combat the ever-increasing quantities of dirty eggs at packing floors, they would realise that such achievement is not only possible but far more economical to attain than by trying to evolve any system of cleaning. I feel that we, in Australia, in endeavouring to evolve a satisfactory method of cleaning after dirty production, are tackling the position from the wrong end.

If, for argument's sake, we could find some method of successfully cleaning eggs to-day, and it was put into commercial use, and assuming that dirty eggs represented 20 or 30 per cent. of the pack, what would be the logical outcome? I suggest that as there was little or no penalty for dirty production, many of our producers now producing clean eggs would not make the effort they now do. What encouragement would there be to do so? And in a relatively short space of time the percentage of dirty eggs would progressively increase, until we found ourselves in the same position as Ireland was in only a few years ago. Why bring the field back to the pace of the slowest horse? Rather, is it better to assist and train those slow horses to do better? Are commercial producers going to allow this great industry to sink down to the level of the minority? The position must be attacked as a production problem for the prospects of the industry are too good to sacrifice them without a game fight against dirty production.

I feel sure producers throughout Australia who have the future of their industry at heart will realise that this is the only way in which to attack this problem, and must know it is in their own interest to do so, particularly if they are made aware of other countries' experience and achievements.

We have in our midst the opportunists who are thinking only of the present and prepared to cash in on present prices, with no thought to the future of the industry or the influence quality must have on the destiny of the industry.

There will also be some side-line producers who will be loath to take the necessary steps to produce clean eggs, since their interest is for a limited period of the year only and concerned mainly with a small surplus over domestic needs. But what of the commercial farmers who look to their industry for their sustenance throughout the whole year, and haven't any other source of income, and who are the backbone of the industry: are they going to let their industry be brought down without some say in the matter?

The ball is at the foot of the producer to-day; if the game is played properly then the producer will win out, and I believe the reward will justify whatever effort it takes, for, as I see it, providing Australia can give quality of a high standard, there are great prospects for the industry for at least a considerable number of years. If later, world production results in a keen competitive market again, quality and quality alone will keep Australia in her present market, for Australia should be able to combat any competition on a price basis.

To ensure that the industry is well equipped to meet the competition that will one day be facing it, I strongly believe that we must think in terms of—

(1) Concentration on the production of eggs clean from the nest.

(2) The complete elimination of washed eggs from the export pack not only to the United Kingdom but to other destinations.

(3) The elimination of all fertile eggs from the export pack whether to United Kingdom or other destinations.

(4) The oil processing of all eggs for export.

(Continued on page 336).

LARGE ROUND WORM INFESTATION IN FOWLS.

F. G. FIELDER, B.V.Sc., Veterinary Research Officer.

THE common round worm (*Ascaridia galli*) occurs principally in the domestic fowl, but has also been noted in turkeys and ducks. It exerts its most harmful effects in young stock, which may show evidence of infestation in the first fortnight after contact with infested soil, by such symptoms as loss of appetite, drooping wings, ruffled feathers, weakness and decreased activity. Diarrhoea, paleness of the comb, dull plumage and loss of colour in the legs may also be evident. Growth of the birds is arrested and they become progressively anaemic and emaciated. Prostration and death may follow as early as the third week after infestation.

In older birds similar effects are noticed, but death is much less frequent in old than in young birds. Cases of intestinal impaction with rupture of the intestinal wall have been recorded.

Generally speaking it is impossible to state how many parasites are necessary to set up harmful effects as this depends on the age of the bird, resistance and conditions of management and feeding. As a rough guide the following numbers may be considered harmful:—

Young birds (2-4 months)—20 to 30 worms.

Birds at 6 months—30 to 40 worms.

Laying hens on adequate diet—50 or more.

Life Cycle of A. galli.

Under optimal conditions for development the worm eggs may become infective in eight days, and after being picked up by the birds hatching occurs in the small intestine. For the first nine days the larvae live freely in the bowel. From the tenth to the nineteenth day they attack the intestinal wall and feed upon the epithelium lining the bowel. After the nineteenth day the larvae again live freely in the bowel. The minimal maturity period recorded is twenty-seven days.

Factors Affecting the Life Cycle.

1. *Temperature.*—The optimal temperature for egg development is 91 deg. Fahr. Fresh eggs may withstand temperatures as low as 19 deg. to 27 deg. for about seventeen days. Temperatures higher than 91 deg. are eventually fatal.

2. *Sunlight.*—Fresh and embryonated infective eggs exposed to sunlight in a liquid medium did not survive for periods longer than 3 hours; when associated with conditions of desiccation no eggs survived exposure to sunlight for longer than two hours. Eggs in fresh, normal-sized droppings allowed to dry out were killed in sunlight after fourteen days, whilst the presence of moisture increased their longevity to twenty-eight days.

3. *Shade.*—Eggs in fresh normal-sized droppings allowed to dry out in the shade lived thirty-seven days.

4. *Longevity of the Egg.*—Eggs in droppings exposed to natural conditions of rainfall, etc., survived 249 days in shaded positions and 103 days in a position constantly exposed to sunlight.

The above facts indicate the importance of sunlight and desiccation in the control of round worm infestation, by causing the death of the infective eggs and so reducing the degree of infestation to which the birds are exposed.

Resistance of Chicken to Round Worms.

It has been noted that in cases where natural infestation has occurred, young birds are affected to a much greater extent than older birds. This has led to the recognition of two types of resistance:—

(*a*) *Age Resistance.*—Chickens develop with increasing age a marked resistance both to infestation itself and its effects. This is denoted by the difficulty the worms experience in establishing themselves and developing in old birds.

(*b*) *Acquired Resistance.*—This resistance is developed by the bird as a result of infestation and its influence tends to become

more marked under the stimulus of repeated infestations.

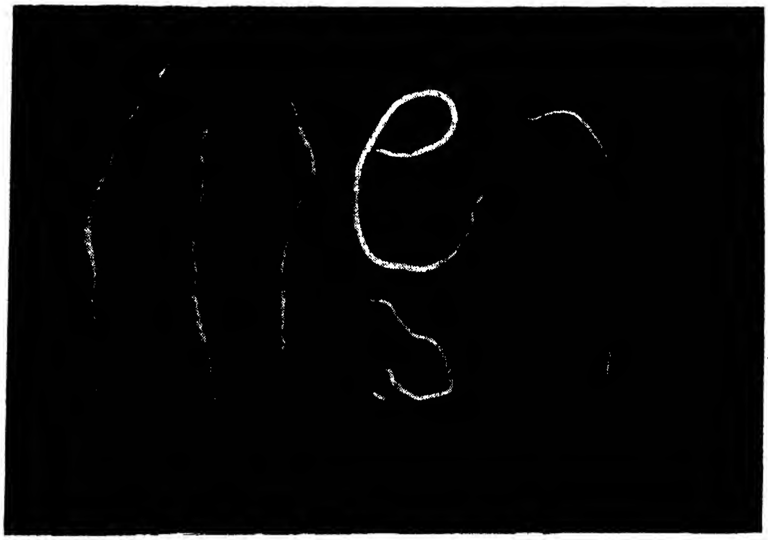
Theoretically old birds should remain practically unaffected by *A. galli*, both by virtue of age and by the fact that they may have been continuously exposed to infestation over a long period. In practice, however, this is not the case, and serious infestations may be encountered in such birds. In this regard it has been shown that diets deficient in Vitamins A and B and animal protein may affect the resistance of the fowl to round worms. Any factor affecting the health of the bird may make it more susceptible to infestation.

efficiently treated owing to their depressed appetite. On the other hand the most vigorous and healthy pullets will eat a large quantity of the medicated food, resulting in an overdose which may upset their health and check their development.

Individual Treatment.

1. Carbon Tetrachloride.

A dose of 0.75 ml. per lb. body weight for young birds, with a maximum dose of 2 ml., is highly effective against *A. galli*. It is important that *birds should be starved for 17 to 24 hours prior to dosing;* that is to say, the evening meal should be omitted



Round Worms (*Ascaridia galli*) from the Small Intestines of a Fowl showing Mature and Immature Forms.

(Natural size).

and the birds dosed the following morning. Failure to starve the birds may result in a high mortality. Water should be available to the birds during this fasting period. Feed may be supplied 5 to 10 minutes after dosing.

Experiments with young birds indicate that the efficiencies of the methods employed may be placed as follows:—

(*a*) Hard or soft capsules.

(*b*) Carbon tetrachloride, with equal parts paraffin by syringe.

(*c*) Carbon tetrachloride by syringe.

In adult birds, however, the efficiencies secured from administration per capsule and per syringe were about equal and greater than that of the drug plus liquid paraffin.

CONTROL MEASURES.

In the control of worms in poultry the first essential is to endeavour to prevent or reduce infestation. Spelling of yards for a portion of each year and placing chickens on new ground or ground to which adult fowls have not had access for some months will help considerably to reduce or even prevent infestation.

In spite of the above precautions treatment of the fowls may be necessary. Two methods are available, viz.: (*a*) Individual treatment, and (*b*) flock treatment.

Individual treatment is superior to flock treatment by virtue of the fact that each bird in the flock receives a full dose. Flock treatment is less successful due to the fact that the heavily infested birds will not be

Paraffin was originally included to increase the bulk of the dose and protect the birds from any possible toxic effects. However, in view of the cost of capsules and labour, *it is recommended that the drug be given to all birds irrespective of age, by syringe or gun,* any loss of efficiency among younger birds being more than compensated for by the low costs of this method of administration. The use of the syringe may be followed by unfavourable results more often than the capsule method, due to inhalation of the drug, or death may follow the introduction of the drug into the lungs through careless administration.

Method of Dosing.—The drug can be administered by any suitable syringe, or gun. The most convenient method is to carry the carbon tetrachloride in a suitable container attached to the operator's belt. The syringe is dipped into this container and a quantity of the drug drawn into the syringe or gun. These should be graduated in half millilitres, and should have a gently curved nozzle 4½ inches long. This nozzle should be not more than 3/16 inches in external diameter and the point should be rounded so that it will not lacerate the bird's mouth or throat. Three or four birds can be dosed in rapid succession and then the syringe refilled from the container. The speed of the operation is usually limited by the rapidity with which the assistant can make the fowls available; with practice the operator can dose fowls as fast as they can be held in position for him. Immediately after administration of the dose the bird should be held in position for a moment so that the drug passes right into the crop and is not discharged by the bird flinging its head about.

Mode of Administration.—The bird is held by an attendant. The operator takes the bird's head in his left hand, pushes the beak open with his left index finger and, holding the syringe in his right hand, gently but rapidly inserts the nozzle of the syringe down the oesophagus for 4½ inches. In doing this care should be taken to keep the nozzle of the syringe pressed against the dorsal (top) wall of the gullet to ensure that it passes down the gullet and not down the windpipe. While the nozzle is being passed down, the bird's neck should be held extended. If the nozzle is not placed down the gullet at least 4 inches (that is, almost into the crop), the dose of carbon tetrachloride may be regurgitated, some of it may pass down the trachea, in which case the bird will almost certainly die within a few seconds. A little practice and dexterity are required to avoid such deaths.

Place the Birds on Wire-netting.—Immediately after dosing, the birds should be placed on wire-netting, so that worms voided may be collected on the floor of the house. Placing birds on wire-netting may be arranged in several ways: large crates may be made into which the birds are placed, or wire-netting frames may be constructed and placed on the floor of the house. These frames should be made in sections to fit all houses in which it is desired to treat birds. Birds should be left on the wire-netting for at least six hours, by which time most of the worms will have been voided.

The practice of treating birds for worms and then allowing them their usual range cannot be too strongly condemned. If the drug is effective, the worms will be voided in the droppings and this will result in a heavy infestation of the ground surface with worm eggs, which will later re-infest the poultry and the last state of the flock may be worse than the first.

2. Tetrachlorethylene.

A dose rate of 1 ml. is effective in birds up to 2 lb. 12 oz. in weight. Birds are starved for 17 hours (overnight) before treatment, the drug being administered in hard gelatine capsules. This drug is more toxic than carbon tetrachloride. Results of trials with tetrachlorethylene have not been very satisfactory, it being unreliable in its action.

3. Solution of Nicotine Sulphate. (40 per cent. nicotine sulphate.)

This drug has been noted to give rise to toxic effects in some cases and may cause a drop in production. The highest efficiency was secured from a 2 minim dose (for birds 15-26 oz.) which removed 58 per cent. of the worms in one experiment. For these reasons it is not recommended. Birds are starved for 17 hours (overnight). The dose is administered in hard gelatin capsules.

Conclusions.

Carbon tetrachloride is the most efficient drug for the treatment of round worm infestation. The effective dose is 0.75 ml. per

lb. body weight, not exceeding a total of 2 ml. This dose appears reasonably safe although it may cause slight diarrhoea. The margin of safety with carbon tetrachloride is fairly high, a dose rate of 4 ml. per lb. body weight being toxic, but not lethal.

Birds should be starved overnight, treated early next morning and fed a few minutes after treatment.

Flock Treatment.

1. *Drugs in the Drinking Water.*—As the intake of the drinking water varies to a great extent throughout the year and does not appear to be associated with age or weight to the same degree as intake of food, consistent results from any drug administered in this way cannot be expected.

2. *Drugs in the Mash.*—A mash containing 0.5 ml. of a 40 per cent. solution of nicotine sulphate per lb. weight of dry mash is capable of giving a high efficiency against round worms if fed continuously over a period of seven to eight days.

The addition of copper sulphate is not warranted. In fact, the continuous feeding of copper sulphate over a few days may have harmful effects upon the birds.

The mash must be freshly prepared every day. The nicotine sulphate solution is best mixed when each 0.5 ml. is added to 150 ml. of water. The mixing must be thorough so that the mash remains flaky and devoid of lumps.

Methods of Preventing Infection.

The control of any parasitic disease cannot be brought to a high standard of efficiency unless measures are enforced to prevent infestation by the parasites concerned or at least to maintain their numbers below the level at which the parasites become harmful.

The intensive system lends itself more readily to helminth control than the free range system.

As the worm eggs become infective in a minimum period of eight days, all that is necessary is removal of the droppings at regular intervals of at least seven days. The floors must be of concrete or wood to allow a thorough removal of all droppings.

Other Measures to be Adopted.

(1) Incubators should be thoroughly cleaned before use and all movable fittings dipped in a boiling 5 per cent. disinfectant solution.

(2) Young chickens are best confined in brooder pens with concrete or wooden floors (concrete for preference). If concrete or wooden floors are too expensive, brooder-pens should be placed on soil on which poultry have never been present or have not been running for a number of years. The floor should be previously cleansed with a 5 per cent. boiling solution of a disinfectant with a high phenol and cresol content, such as carbolic and cresylic acids. Obviously this solution could not be applied to runs with earthern floors, but it could be used with advantage in houses with concrete and wooden floors. The solution should be used liberally and applied boiling.

(3) Special precautions should be taken with young birds till they are about 3 to 4 months old.

(4) The food should be fed as far as practicable from hoppers. Drinking vessels should be of the type which do not cause surrounding soil to be constantly damp.

(5) All damp places in yards (especially shady positions) should receive special attention.

(6) Avoid overstocking.

(7) Rotation of runs and yards is advisable—where possible yards should be spelled for periods of at least one year.

(8) Finally consideration should be given to the ration employed. It should be well balanced, with adequate quantities of vitamins A and B and of animal protein. Close attention should also be given to other measures assisting towards maintaining a good state of health.

"I WOULD appreciate it if you would be kind enough to send to me the April and May issues of the *Gazette*, as I do not receive the *Gazette* now, though I have bound copies of over forty years, and used to regard it as the 'Bible' of Australian agriculture—A WESTERN AUSTRALIAN AUTHORITY."

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingba State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road Holgate, via Gosford
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp. Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

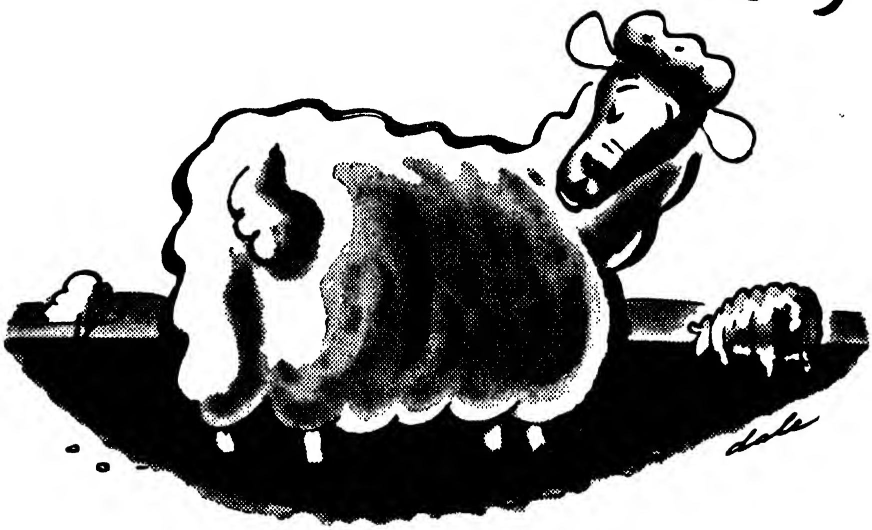
Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa (Jerseys) ...	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	30
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Hawkesbury Agricultural College, Richmond (Jerseys)...	106
Hicks Bros., "Meryla," Culcairn (A.I.S.)	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
McEachern, H., Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, "Jerseymead," Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys) ...	49
New England University College, Armidale (Jerseys) ...	25
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	35
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco (Jerseys)	89
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Von Nida, F. E., Wildes Meadow...	30
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas, R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R. "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale ...	62
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Peat & Milson Islands Mental Hospital	72
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	69
Salway, A. E., "Coolagalite," Cobargo	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

"Shh! we're lifting a mortgage"



All you'll ever raise from a worm-weak flock is a robust mortgage. So . . . this year don't risk costly flock losses through gastro-intestinal worms. Drench with "Phenovis"—the effective gastro-intestinal worm remedy. Choice of successful graziers everywhere, "Phenovis" is based on Phenothiazine, best and most effective control for nodule, large stomach, and black scour in sheep, and gastro-intestinal parasites in other stock. "Phenovis" is non-toxic to sheep when used as directed and is supplied ready to use in handy powder form. Simply mix with water and drench as directed.

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IP11-248

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.)	120	13/11/48
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., 'Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	33	23/6/48
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/4/49
Cowra Experiment Farm (Ayrshires)	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C. Elwatan, Castle Hill (Jerseys)	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.)	59	2/8/48
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49	17/12/48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L. "Pine Park," Mumbi Beef Shorthorns)	74	2/2/49
Limond Bros., Morisset (Ayrshires)	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys)	94	27/10/48
Riverina Welfare Farm, Yanco (Jerseys)	91	14/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	119	20/4/48
Yanco Agricultural High School, Yanco (Jerseys)	74	26/4/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/4/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle	49	14/4/48
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	209	12/8/48
Burns, R., "Wilga Glen," Coonamble	20	24/12/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell	32	11/8/48
Coventry Home, Armidale	11	29/9/48
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell	34	5/4/49
Ebsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	33	9/4/49
Forster, T. L., and Sons, "Abington," Armidale	67	27/4/50
Frizelle, W. J., Rosenstein Dairy, Inverell	111	9/9/48
Genge, G. L., Euston, Armidale	36	22/9/48
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood	22	20/5/48
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm Gum Flat Road, Inverell	60	13/6/49
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	34	22/9/48
Ince, W. G., Kirkwood St. Armidale	11	12/4/49
Johnson, A., "Rosedale," Grafton Road, Armidale	34	22/9/48
Kenmore Mental Hospital	77	7/7/48
Koyong School, Moss Vale	2	5/3/47
Lott, J H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lowe, W. W., Booral, Via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Gladesville Mental Hospital	7	12/12/48
Lunacy Department Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department,, Rydalmere Mental Hospital	40	20/11/48
McMillan, N., Duval Road, Armidale	30	29/9/48
MacNamara, B "Mount View," Cessnock	58	16/5/48
Marist Bros. College, Campbelltown	82	23/1/49
Mason, A., Killarney, Armidale	33	30/9/48
McLachlan, M. "Brodies Plains." Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley Swanbrook	17	26/6/49
Morris, S. W., "Dunreath" Swanbrook Rd., Inverell	51	23/5/48
Mullen, A. G., Goonoo Goonoo, Via Tamworth	57	6/3/49
Mulholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	12	29/12/48
St. John's Hostel, Armidale	6	24/6/49
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills	43	5/6/48
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boy's Home, Westmead	33	9/7/48
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree	54	5/4/49
S.C.E.G.S., Moss Vale	34	8/4/49
Tanner, F. S., Dural Rd., Armidale	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale	33	30/9/48
Tombs, P. C., Kellys Plains, Armidale	49	29/9/48

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
Tombs, R., Harlwood, Armidale	40	22/9/48
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48
Von Frankenberg, F. E., "Spring Hills," Camden	68	12/12/48
Wallaga Lake Aboriginal Station	10	8/5/48
Waters, A., Marsh Street, Armidale	2	13/10/48
Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson, Masonic School, Baulkham Hills	52	10/6/48
Williams, L. B., "Birida," Armidale ...	39	12/4/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Need for Improved Rural Veterinary Services.

OFFICIALLY opening the 25th Annual General Meeting of the Australian Veterinary Association, at the Sydney University School on 24th May, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) expressed concern at the tendency of graduates in veterinary science to open up practices in the big cities. Mr. Graham said he felt that this was not in keeping with the requirements of veterinary services in rural areas. "There is a great need for rural veterinary services and any action on the part of your association in this direction is to be commended," said the Minister.

"Unfortunately," continued Mr. Graham, "the veterinary section of my Department is still suffering from staff shortages, but it is pleasing to see such a large number of students now in attendance at the veterinary school. There is a wide field in Australia for veterinary surgeons and I hope that before many years have passed, Departmental staffs will have been restored."

Mr. Graham said that in addition to the research work being carried out at Glenfield Research Station into nutritional and other diseases affecting stock the Department was preparing to undertake sheep and wool research in a new laboratory at present being constructed at the Trangie Experiment Farm.

"I am also very interested in extending artificial insemination, especially in dairy cattle," said Mr. Graham. "A considerable amount of work in connection with artificial insemination has already been done at Glenfield and the Department is now in a position to apply the technique in the field. The establishment of artificial insemination centres at experiment farms in dairying areas is receiving my attention and I have in mind plans for progeny testing of bulls so that the Department could provide a service to farmers from proven sires."

Poultry Notes—*continued from page 329.*

(5) Air conditioning of all export packing establishments.

(6) Greater attention to transport facilities both from the angle of its effects on the internal and external structure of the egg and cool carriage of the eggs.

These are all factors that one day will have to be faced up to—so why not now and thus be ready for competitive markets we will one day have to meet if we are to continue the industry on the production level it will attain in the M.O.F. contract period?

The Administrative Buildings, Hawkesbury Agricultural College.

The Agricultural Gazette

Editorial—

RURAL ADULT EDUCATION.

Agricultural Bureau Conference.

A COLOURFUL function is to be staged at Hawkesbury Agricultural College this month. It will crown the year's work of a voluntary association of farm people who have dedicated their organisation to the fulfilment of rural adult education in its broadest sense, agricultural education in particular, and, withal, an enrichment of the meaning of rural citizenship.

The occasion is the 25th Annual State Conference of the Agricultural Bureau of New South Wales, which will be officially opened by His Excellency, the Governor of New South Wales, Lt.-General Northcott, on 20th July, and will comprise three days and nights of educational and entertaining sessions. Lectures, discussions, debates, practical demonstrations, film screenings and theatricals will provide the bill of fare for the 250 men and women delegates of Bureau Branches who will be in residence.

Delegates will come from far and wide—from north, south and central coasts, from the tablelands and from the west. They will mix in the friendly manner and under circumstances peculiar to their unique organisation. Rooms meant to accommodate one bed will, for three days and nights, provide floor space for two beds. Delegates from wheat and sheep areas will find themselves room-mates with orchardists or dairy- or pig- or poultry-farmers. Irrigationists will share rooms with dry farmers.

Many a "sub-conference" between protagonists of the varying industries will take place "after hours" over coffee and biscuits in front of the log fire in the College canteen or over a "billy" of tea boiled on a primus in a back room, to wash down the turkey brought down from the farm for supplementary feeding.

Each morning delegates will be seen going their various ways to demonstrations at the College Dairy, or Piggery or Poultry or Sheep and Wool or Apiary Sections—to attend sessions so arranged as to provide the minimum clash of interests. Some delegates, side-tracked by private conferences may play truant, with their elbows and feet on the rails of a livestock pen or beside a crop trial, but most will be at the appointed places at the appointed times.

In the afternoon delegates will take part in indoor sessions arranged to meet the needs of the various industries—fruit and vegetable industry sessions such as those on "Hormones in Agriculture," "The Quick Freezing Preservation of Fruit and Vegetables," "Recent Developments in the Realm of Insecticides"; sessions for cereal and

livestock farmers, at which a panel of experts, aided by microphone and a public address system will quietly discuss the "Cereal Grain Industries in Relation to Livestock Enterprises," and a famous beef cattle stud man will speak on "Beef Cattle Husbandry—from Breeder to Feeder to Hook;" sessions at which authorities will address the delegates on new interests in crop husbandry, science and practice in animal husbandry, factors in the drift from the land, our increasing knowledge of soil fertility.

Evening sessions will be devoted to the demonstration of yet other methods of adult education, which will in themselves, be both entertaining and educational. Selected films will be shown, a debate on the topic "That Primary Industries in Australia should be Subsidised," will be presented and a 3-act play provided by the Kuring-gai Theatre Guild—all typical of activities which would be worth-while developments back in the farming areas.

Meanwhile, women delegates will be discussing handicrafts and hobbies, the growing boy and girl, the parents' part in education, home beautification, and similar interests.

When the Conference breaks up on Friday, 23rd July, delegates will leave the College with regrets, but with a feeling that life has been enriched, not only by a fund of information but also by the pleasantries of those new contacts with other farming people from all corners and all primary industries of the State, by new and permanent friendships. The Department of Agriculture will have taken on new meaning for many delegates who have not previously had so close a contact with a Departmental institution.

Back in the farming localities the delegates will report to the members of their respective local branches. With few, if any, exceptions they will express a hope that before many years it will again be their turn to represent the Branch at a State Conference of the Agricultural Bureau at Hawkesbury Agricultural College.

Our next issue will report the proceedings at the Conference.

Committee Set Up to Co-ordinate Wheat Harvest.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) has announced the personnel of an Advisory Committee which he has set up (comprising representatives of wheatgrowers and their organisations, the Flour Millowners' Association, Department of Railways, and the Department of Agriculture), for the purpose of co-ordinating all matters relating to the harvesting of next season's wheat crop, including the receival, transport and distribution of the crop.

The Committee will comprise Mr. A. H. E. McDonald, formerly Chief, Division of Plant Industry, Department of Agriculture, as Chairman; Mr. L. S. Harrison, Wheat Commissioner and Manager, Government Grain Elevators, as Deputy Chairman; Mr. A. G. Dennis, Chief Traffic Manager, Department of Railways; Mr. M. R. Dunkley, Flour Millowners' Association of New South Wales; Mr. L. Burke of Birriwa Wheatgrowers' Union; Mr. H. Roberton, Farmers & Settlers' Association; and Mr. T. McGrath of Urana, as the Minister's representative.

Mr. Graham said that the Committee would meet regularly and would give careful consideration to the whole question of the harvesting and receival of this year's wheat crop. The Committee would report to him from time to time on any matters requiring urgent and special action, so that all difficulties likely to be encountered by the industry could be dealt with in time to ensure a smooth and efficient organisation.

"In this way," added Mr. Graham, "I hope to overcome many of the problems associated with previous harvests and relieve wheatgrowers as far as possible of any anxiety regarding the harvesting, storage and transport of their next crop."

Value of—

RED CLOVER IN MAIZE AND OATS ROTATIONS.

YIELDS IMPROVED AND FERTILITY MAINTAINED.

Results at New England Experiment Farm.

THE main farming areas of the New England district were originally very fertile and produced heavy crops year after year. However, over a period of years the productivity of these soils has declined. This loss of fertility is reflected in the lower yields now being obtained on many of the older farms. Many farmers have reached the stage of looking for new land on which to grow their crops, as production on the old soils by the present system of farming is uneconomical.

The popular farming practice in New England is to grow maize and oats, both soil-exhausting crops, as main cash crops—more or less continuously. In the absence of soil-improving crops this system must result in soil impoverishment, and its attendant ills. Soil fertility—like a banking account—if constantly drawn upon without anything being put back, becomes lower and lower, until finally many areas which were formerly highly productive do not produce payable crops.

The obvious question that may be asked is "What is the cause of this fall in productivity?" This question is easily answered. Undoubtedly, the loss in productivity or fertility of these soils is due to either lack of crop rotation or unwise rotations. The solution of the problem is of course, the adoption of suitable rotations.

In order to assist farmers of New England to use economic rotations that will maintain soil fertility, the Department of Agriculture, in 1921, commenced what is popularly known as "The Rotation Experiment" at the New England Experiment Farm, Glen Innes. The results observed from these rotations are set out in the article which follows.

There are two types of crop which may be grown, namely, soil-improving crops and soil-depleting crops. By growing only the former, a farmer may greatly build up the fertility of his soil. However, it may not be economical to grow only crops of this type. On the other hand, continuously growing soil-depleting crops reduces soil fertility, and eventually payable crops are not produced. The obvious course to take is to grow the two types of crops so that a payable crop is produced and at the same time the fertility of the soil is at least maintained, or, better still, improved. The fact that this balance can be struck has been conclusively illustrated by the rotation experiment at New England Experiment Farm.

Details of the Experiment.

For the past twenty-five years a comprehensive experiment has been carried out with two of the main New England crops, namely, maize and oats. The experiment plots are located in a permanent position on a heavy, black basaltic soil, typical of many maize and oat areas in the district.

The experiment consists of seven courses or types of rotations, any one of which could be, or is, adopted by a maize and oat grower. In designing these rotations, the practical viewpoint was kept in mind, in order to free the experiment of any abstract complications. For the purpose of evaluating the effects of Red clover on yields, comparable rotations were designed, some with and some without Red clover. The effect of the clover in the rotation is measured in the effect on yield. Other things, however, should be considered, some of these being the grazing produced, the effect on the chemical and physical composition of the soil, and the effect in reducing soil erosion,

The rotations which may be compared are set out and discussed below.

Red Clover in a Three-year Rotation.

In this section of the experiment the following rotations were compared:—

Rotation 1: Maize—spring oats.

Rotation 2: Maize—spring oats—Red clover.

Rotation No. 1 is an old rotation and is soil-depleting. The effect of adding the Red clover crop in rotation 2 was to reduce the number of cash crops by one every three years. This resulted from the fact that the Red clover occupied the land for that year. The clover seed was sown with the oats and was allowed to continue growing after the hay was harvested. Sheep were grazed on the sward.

Over a twenty-four year period, in the two-course rotation of maize and spring oats, twelve crops of each were harvested. The addition of Red clover reduced the crops in rotation 2 to eight each of maize and oats, but eight swards of clover with a total pasture life of nine years and four months were also grown.

The question to be answered is: Did it pay to include the Red clover? An examination of Table 1 will show that by the addition of Red clover there was an increased yield of 43 bushels of maize over the twenty-four year period, and a decrease of only 10 cwt. of oaten hay over the same period.

TABLE 1.—Yield of One Acre of Maize and Oats over a Twenty-four year period.

Rotation	Maize (bushels)		Oats (cwt.)	
	Total	Average per acre	Total	Average per acre
1	339	28·3	298	24·8
2	382	47·8	288	36·0

The average yield per acre of maize was increased by almost 20 bushels, while the average yield per acre of oats was 11.2 cwt. more.

To achieve this, four less crops of each were grown. This means that the cost of production of the total maize and oats from the legume rotation was one-third less than that of the rotation which did not include the legume. In addition the clover provided eight grazing swards, each of fourteen months' duration, and these carried at least three sheep per acre during the life of the sward. The only cost for the clover was the seed, which was sown at the rate of 6 lb. per acre.

The net result then, of including Red clover in the rotation was to increase the

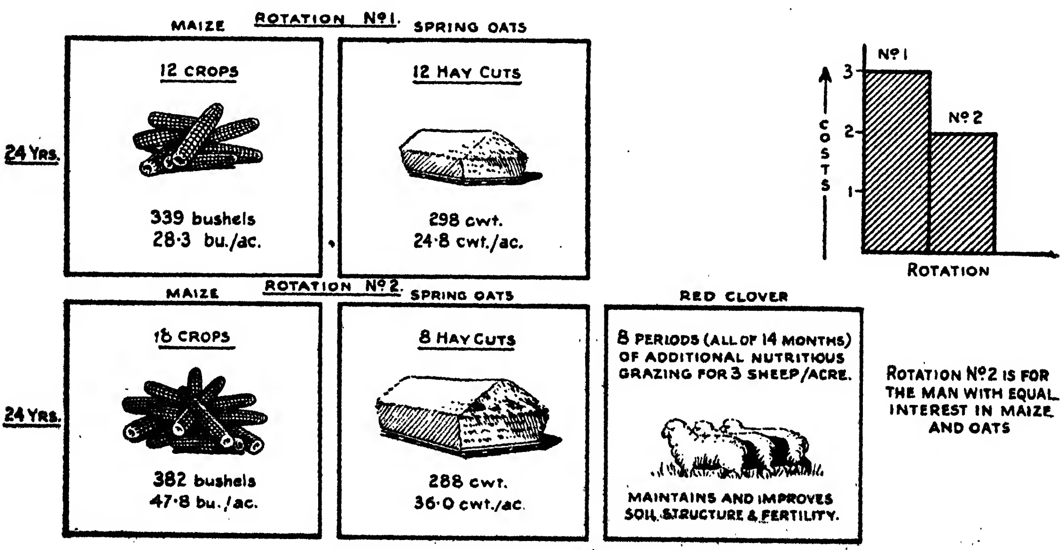


Diagram showing Results from Rotations 1 and 2.

total yield of maize, only slightly decrease the total yield of oats, and provide grazing for 3 sheep per acre for nine and a half years over the twenty-four year period.

Reference to Table II will show that although the total amount of maize and oats was greater in rotation 3 than in rotation 4, the average yield per acre was greater in

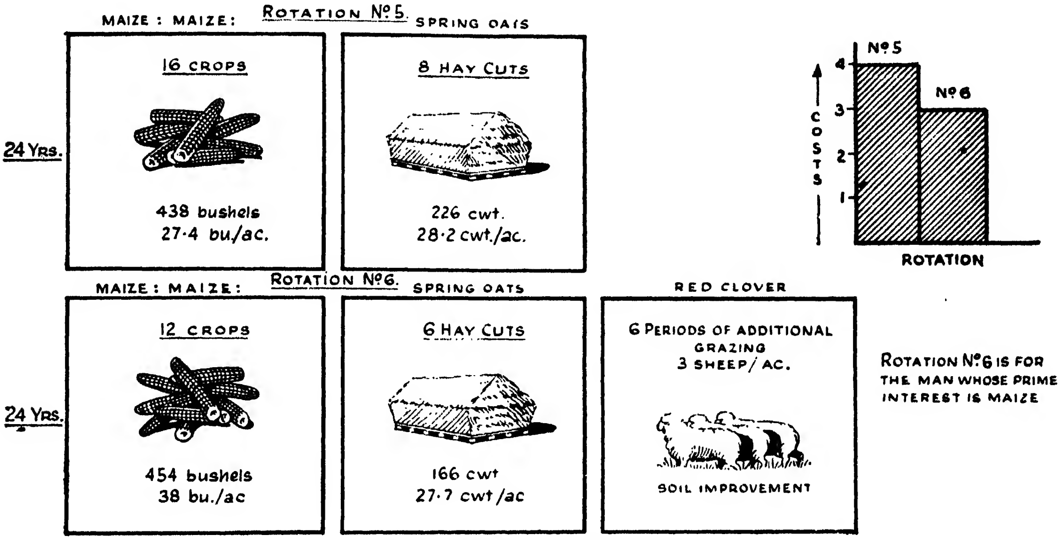


Diagram showing Results from Rotations 5 and 6.

Maize, Oats, Oats and Then Red Clover.

In this section the effect of including a crop of Red clover after a maize and two oat crops is demonstrated.

Rotation 3: Maize—spring oats—autumn oats.

Rotation 4: Maize—spring oats—autumn oats—Red clover.

In rotation 3, one maize and two oats crops were grown every three years, so that during the twenty-four year period under review eight maize and sixteen oat crops were grown. In the case of rotation 4, six maize crops and twelve oat crops were grown, together with six swards of clover over the same period.

TABLE II.—Yield of One Acre of Maize and Oats over a Twenty-four year Period.

Rotation	Maize (bushels)		Oats (cwt.)	
	Total	Average per acre	Total	Average per acre
3	294	36·7	512	32
4	271	45	404	33·7

the latter. In addition there were six swards of clover for grazing in rotation 4 and the crops of maize and oats were produced at only three-quarters of the expense of those in rotation 3.

Red Clover After Two Maize Crops and an Oat Crop.

Results of this section of the experiment demonstrate the value of Red clover where two crops of maize are grown to one of oats.

Rotation 5: Maize—maize—spring oats.

Rotation 6: Maize—maize—spring oats—Red clover.

In rotation 5, two maize crops and one oat crop were produced every three years, while in rotation 6 two maize crops, one oat crop and one clover crop were produced every four years. This means that in the twenty-four period under review, rotation 5 has produced sixteen maize crops and eight oat crops, whilst rotation 6 has produced twelve maize crops, six oat crops and six swards of clover.

Table III shows that despite the fact that four crops less maize were grown

during the period, the total yield in rotation 6 was 16 bushels more, and the average yield per acre was 10½ bushels greater. In the case of oats, the total production in rotation 6 was less, but the average yields per acre were practically the same. Once again there were six swards of clover for grazing in rotation 6 and the cost of producing the maize and oats was only three quarters that of rotation 5.

TABLE III.—Yield of One Acre of Maize and Oats over a Twenty-four year Period.

Rotation	Maize (bushels)		Oats (cwt.)	
	Total	Average per acre	Total	Average per acre
5	438	27·4	226	28·2
6	454	38	16[illegible]	27·7

In both cases, over the twenty-four year period, there were six crops of maize, twelve crops of oats, and six swards of clover.

TABLE IV.—Yield of One Acre of Maize and Oats over a Twenty-four year Period.

Rotation	Maize (bushels)		Oats (cwt.)	
	Total	Average per acre	Total	Average per acre
7	243	40½	442	36¾
4	271	45	404	33⅔

Table IV shows a total increased yield of 28 bushels of maize when Red clover immediately precedes the maize as in rotation 4, but there is a decrease of 38 cwt. of oats. Therefore, rotation 7, where the clover is between the oat crops, is recommended where oats is the main crop.

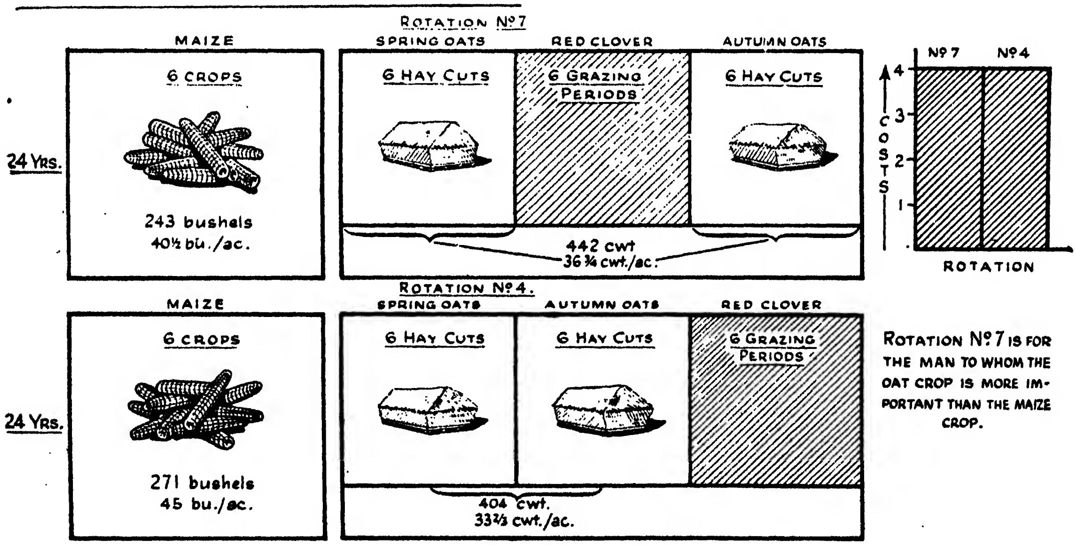


Diagram showing Results from Rotations 7 and 4.

Place of Red Clover in the Rotation Where Oats is the Main Crop.

In this section the results of the following rotations are compared:—

Rotation 7: Maize—spring oats—Red clover—autumn oats.

Rotation 4: Maize—spring oats—autumn oats—Red clover.

These two rotations were designed to get some idea of the best position for Red clover in the rotation when oats is the main crop.

General Discussion of Results.

It is significant and conclusive that the inclusion of a legume in a rotation will increase the return per acre over a number of years, will supply areas of excellent grazing land, and will improve the texture of the soil so that cultural operations may be more easily carried out.

The rotation to be adopted on any farm will vary according to the main cash crop to be grown. It is suggested that farmers study the several rotations outlined in this

article and choose the one most suited to their own particular requirements. The point to remember in all cases is that Red clover has a place somewhere in the cropping programme.

By including a legume, not only are yields increased, but the crops look healthier and there is a greater chance of getting a good crop in a bad season.

Enormous advances have been made in knowledge and facilities for farming since the days of the pioneers of New England. Have we advanced with the times? Earlier in this article, the question was asked: "What is the cause of declining soil fertility in the New England?" That question has now been answered and a remedy given.

A further question might now be asked: "As the results of this rotation experiment have been publicised throughout the district on numerous occasions, and the experiment plots themselves have been inspected by farmers who could see the effect of Red clover on the soil itself and also on the crops, why has not the 'cult' of growing Red clover become a practice throughout the district?"

Surely it cannot be the cost alone, for the comparatively small outlay per acre for clover seed is far more than offset by the value of the grazing produced! Nor can it be due to an assumed lower annual monetary return from the farm as a whole, for the evidence of the results is against such an assumption! In any case, land improvement is not only measured in cash returns.

New England farmers must face the obvious facts that their soils generally have been seriously depleted of fertility and are being still further depleted, and that legumes, particularly Red clover, are the cheapest and, as shown by these experiments, the surest agents to restore soil fertility.

To do otherwise than use soil-improving crops in a farming system is to contribute towards the destruction of the basis of our national wealth—the soil—and to leave an unenviable inheritance for posterity.

Short Refresher Courses for Ex-Servicemen at Yanco Experiment Farm.

THE following Short Refresher Courses for Ex-servicemen at Yanco Experiment Farm have been arranged for the balance of the current year:—

Number 6 Course.—9th August to 1st October, 1948.

Number 7 Course.—11th October to 3rd December, 1948.

Ex-servicemen who have been discharged for less than one year who desire to attend a course may apply to:—

The Deputy Director Re-Establishment, Ministry of Post-War Reconstruction, Grace Building, York-street, Sydney.

All ex-servicemen who hold a Qualification Certificate under the War Service Land Settlement Scheme, irrespective of the date of their discharge, are eligible for the course and should apply direct to the Deputy Co-Ordinator Rural Training, N.S.W., Department of Agriculture, G.P.O. Box 36A, Sydney.

The course includes farm management, elementary veterinary science, animal production, and feeding. Specialist groups are formed from students interested in sheep and wool, mixed farming, pig and dairy and horticulture.

HIS Excellency the Governor (Lieutenant-General Northcott, C.B., M.V.O.) visited the Head Office of the Department of Agriculture on 30th June and, in the company of the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) and the Under Secretary and Director (Dr. R. J. Noble), inspected the work of the Department's various Divisions and Branches.

Welcoming His Excellency, the Minister said that the Governor's keen interest in the State's rural industries was widely known and appreciated. The Department, said Mr. Graham, covered a very wide field of endeavour in the interest of primary producers. Although many of the Department's activities had of necessity been curtailed during the war, they were now being rapidly developed and extended to meet the ever-growing needs of producers.

REQUESTS are still being received by the New South Wales Department of Agriculture, from primary producer organisations and individual farmers, for assistance to secure supplies of ammunition for destruction of pests.

The Department wishes to point out to all concerned that ammunition control was a wartime emergency measure, and that it no longer exercises control over the distribution of ammunition.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Condobolin (G. L. Maxwell)	August 10, 11
Trundle (W. A. Long)	August 17, 18
Weethalle	August 18
Lake Cargelligo	August 20, 21
Monwonga-Bedgerebong (T. J. Radburn)	Aug. 21
Peak Hill (H. J. Dawson)	August 24, 25
Wagga	August 24, 25, 26
Wentworth (W. B. Crang)	August 25
Grenfell	August 27, 28
Barellan	August 28
Parkes (L. S. Seaborn)	August 30, 31, Sept. 1
Lockhart	August 31, September 1
Young	August 31, September 1
Ungarie	September 1
Deniliquin	September 3, 4
Murrumburrah	September 3, 4
Cowra	September 7, 8
Ganmain (S. J. Pratt)	September 7, 8
Manildra (H. C. Douglas)	September 7, 8
West Wyalong	September 7, 8
Corowa (W. T. Easdown)	September 10, 11
Narrandera	September 10, 11
Mangrove Mountain (W. J. Mitchell)	September 11
Barmedman	September 11
Finley	September 11
Forbes Sheep Show	September 11
Canowindra	September 14, 15
Temora	September 14, 16
Hillston	September 15
Gosford (W. B. Graham)	September 17, 18
Ardlethan	September 18
Eugowra (R. S. Noble, President)	Sept. 21, 22
Leeton	September 21, 22
Ouandialla	September 22
Hay	September 24, 25
Ariah Park	September 25
Bribbaree	September 29
Cudal	October 1
Illabo	October 2
Griffith	October 5, 6
Walbundrie	October 6
Singleton	October 7, 8
Culcairn	October 9
Kyogle	October 13, 14
Cootamundra (D. H. Boyd)	October 15, 16
Lismore National	October 19, 20, 21
Holbrook (Thelma Stewart)	October, 22, 23
Alstonville	October 27, 28
Murwillumbah	November 3, 4
Mullumbimby	November 10, 11
Bangalow	November 17, 18
Nimbin	November 24, 25

1949.

Gunning	February 18, 19
Newcastle (P. Legoe)	February 23 to 26
West Maitland (R. E. Holroyde)	March 2-5
Yass	February 25, 26
Queanbeyan	March 4, 5
Tumbarumba (Mrs. U. M. O'Shea)	March 8, 9
Braidwood	March 11, 12
Burrowa	March 11, 12
Crookwell	March 17, 18, 19
Taralga	March 24, 25
A.C.T.	March 25, 26
Goulburn	March 31, April 1, 2

Approved Vegetable Seed—July, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—continued.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

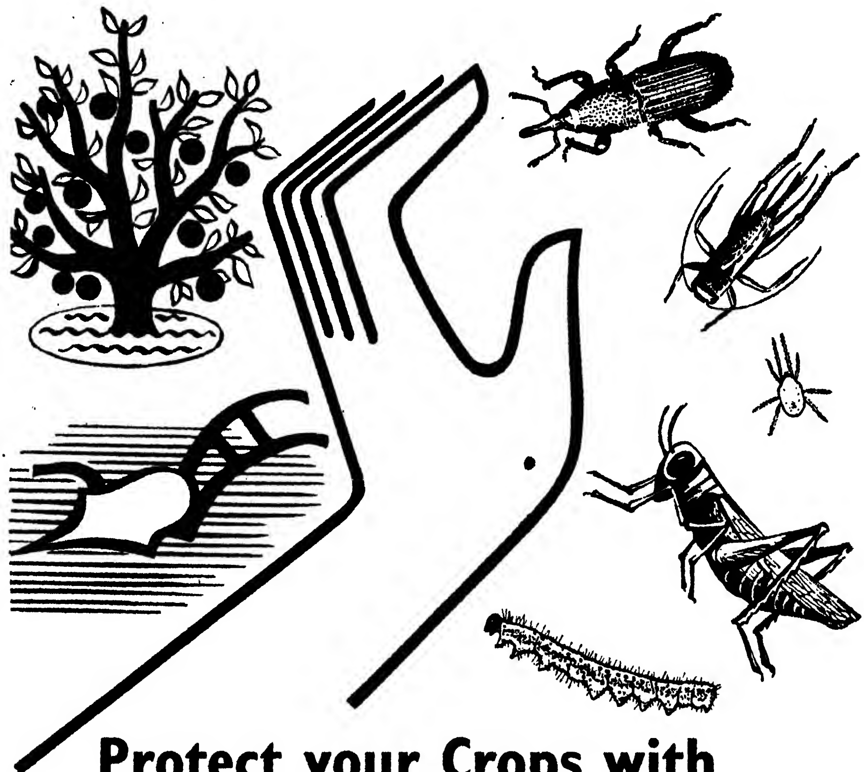
Pumpkin—

Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Tomato—

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.



GRASSHOPPER CONTROL.

Some Recent Developments.

(Concluded from page 288.)

S. L. ALLMAN, M.Sc., B.Sc.Agr., Senior Entomologist, and
J. A. WRIGHT, B.Sc.Agr., Entomologist.

THE advent of insecticides which have made possible an approach to direct control of grasshoppers, the wartime development of dispersal of insecticides from aircraft and the use of insecticidal fogs or aerosols have opened up new possibilities of protecting crops and pastures from the ravages of the plague locust.

In this article, of which previous instalments have appeared in May and June issues, the authors have discussed recent developments in the use of new insecticides by baiting and dusting as well as dispersal by planes and fogging machines.

This concluding portion deals with spraying grasshoppers and summarises the merits of the various methods of control.

Spraying for Grasshopper Control.

Spraying for grasshopper control is mainly of historical interest in that it was the first effective method demonstrated and was widely used in South Africa and Russia. The poisons used were generally sodium arsenite or Paris green, although other arsenicals have also proved effective. The spray was applied to the vegetation on which the 'hoppers were feeding and also direct on the 'hoppers to act as a contact poison. 'Hoppers have also been observed to imbibe the small droplets of spray and this would undoubtedly increase the efficiency of freshly-applied spray.

Stirrup pumps were first used and these were followed later by various types of hand- or power-operated sprays, mainly modified sheep-jetting plants or fire-fighting equipment. With the introduction of poison bran baits it was evident that spraying, even though capable of good results, would be superseded, and this has actually happened in all countries where organised control campaigns have been carried out. The obvious objections to spraying are the amount of equipment required and the necessity for providing and transporting large quantities of water, which is often scarce or inaccessible in the infestation areas. In addition, the risk to stock by direct spraying of pastures with arsenicals is infinitely greater than with poison bran bait as five times as much arsenical is required for treatment of equivalent areas. Furthermore, the tendency is to apply excessive amounts of spray, and considerable stock losses have

Knapsack Spray Pump in Use.
Effective only for small swarms.

been sustained from this cause wherever the spraying method has been improperly used.

In some parts of the State, particularly in the north-west, where the herbage may be very prolific, baiting does not always give satisfactory results and many landholders prefer to spray. A mixture of 1 lb. of sodium arsenite or arsenic pentoxide in 16 gallons of water is used and the rate of application should not exceed 80 gallons per acre. This rate is obtained by passing a fine misty spray relatively quickly over the

Makeshift Spray Equipment.
The tendency to excessive applications makes this a risky method.

area. Molasses is usually incorporated in the mixture and this undoubtedly increases the risk to stock which, in many cases, have previously been hand-fed on molasses concentrates.

The technique usually employed is to spray a band of vegetation around the massed swarm, and also to apply the material direct on to the 'hoppers. A number of landholders in the north-west claim that this method is very efficient and more suited to their local conditions than baiting.

Variations of this spraying method are often used by individual landholders who substitute diesel fuel, power kerosene or similar material for the arsenical. A refinement often adopted is to fire the sprayed area, but the results achieved, as with flame-throwers, is quite illusory and the swarms are scattered rather than wiped out. The cost, scarcity of oil and risk of grass fires soon cause a reversion to the poison bran baiting or spraying methods.

The distribution of D.D.T. in oil from aircraft for mosquito control naturally caused a renewed interest in spraying. The disadvantages associated with the use of aircraft, previously noted, caused investigations to be developed along the lines of reducing the volume of liquid per acre and devising more effective spraying equipment. The introduction of the newer insecticides, and particularly benzene hexachloride and Chlordane, indicated possibilities of direct control by applying small amounts of concentrated insecticides per acre.

Experimental work was carried out with ordinary knap-sack pumps fitted with a special nozzle of 0.03 inch diameter aperture. This produced a fine mist-like spray, at a pressure of approximately 50 lb. per square inch and it was found practicable to apply 6-10 gallons of spray per acre, depending on the density of the swarms and the amount of ground cover. Hand spraying, however, is a slow and arduous process and obviously could only be used on a small scale.

Although power equipment might be modified to approach the above performance, it is considered that the specialised fog-aerosol- or mist-producing machines described previously offer the most effective and practicable approach to the problem of direct application of insecticide with limitation of the water carrier.

Benzene Hexachloride Sprays.

Various formulations of this insecticide, including water emulsions, dispersible powders and solutions in diesel oil, have been tried. All have proved very effective, but it is considered that the dispersible powders gave the most outstanding results. The usual immediate activation that occurs with benzene hexachloride in any form or by any method of application was a feature of the sprays. The repellent and residual toxicity effects were also marked.

The diesel oil mixture (5 per cent., equivalent to 0.65 per cent. gamma isomer of benzene hexachloride) was the same as that used in the Victorian airplane spraying tests. While it was entirely satisfactory in the mortality produced, it can obviously have little use owing to cost and to the undesirability of applying diesel oil to crops or pastures.

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Emulsion or dispersible powder sprays containing 1 per cent. benzene hexachloride (equivalent to 0.13 per cent. gamma isomer) were effective against young 'hoppers, but this concentration had to be doubled for effective use against those in the final (5th instar) stage of 'hopper growth.

For general use, therefore, it would be wise to use sprays containing 2 per cent. benzene hexachloride at the rate of 8-10 gallons per acre. This would necessitate the use of 2 lb. of crude benzene hexachloride per acre or approximately half the amount at present recommended for use against the more scattered grasshopper populations in America.

Chlordane Sprays.

Chlordane for use in spray form has only been available as a xylol emulsion concentrate. Water emulsions of this material were applied at the rate of 8-10 gallons per acre. A 1 per cent. concentration was found to be satisfactory for young 'hoppers although ineffective against those in the 5th instar. However, a 2 per cent. concentration gave an almost complete kill, and this strength should be used as a general recommendation. This would be equivalent to 2 lb. of Chlordane per acre, which is somewhat higher than the overseas recommendation.

Tests of this material have been mainly concerned with direct control of massed swarms and observations on residual effect have been limited. A spray application at the rate of 1 lb. of Chlordane per acre to a well-grassed cricket pitch resulted in a rapid kill of all 'hoppers on the pitch and prevented damage, even though a large population of 'hoppers developed in the surrounding area.

The New Insecticides in Dusts, Sprays, or Aerosols.

Both benzene hexachloride and Chlordane may be regarded as effective substitutes for the cheaper but more dangerous arsenicals. The lack of injury to crops or pastures and the residual effect, the limits of which have not yet been fully explored, are advantages which cannot be overlooked. The immediate gain is the possibility of protecting high value crops and pastures, etc., and growers of such crops are likely to have spraying or dusting equipment. In the past, individual crop losses or destruction of lawns, bowling greens, etc., have received considerable press publicity and limitation of such losses may emphasise to the average landholder the possibility of 'hopper swarm control in the more commonplace pastures.

A sufficient number of tests have been carried out to indicate that the new grasshopper insecticides can be used very efficiently in dusts, sprays or aerosols. The actual method of application does not appear

A Flame-Thrower in Action.
A more spectacular than effective method.

to matter unduly, provided the required amount of insecticide is properly applied to the area or swarm requiring treatment. The objection by many landholders to the use of poison bran bait, present-day shortages of bran and labour and the widely publicised aircraft distribution of insecticides have all combined to focus attention on the possibility of using machinery, with resultant saving of labour and materials.

The choice of method must be governed by such considerations as cost of equipment and insecticides, availability of water, and the policy to be adopted by the authority controlling the grasshopper control campaigns. Dusting equipment is relatively cheap but dusts are usually expensive, and the final cost per treated acre may, therefore, be unfavourable to dusting. The use of large quantities of water is quite impracticable, and it is unlikely that spraying, though well suited to the protection of field crops and orchards, will be widely practised. Fog or aerosol equipment available is expensive, but the present cost per acre of insecticide is not excessive, even when compared with the acknowledged cheapness of poison

bran bait, and the quantity of water necessary is small by comparison with conventional spraying requirements.

At the moment, it does not appear likely that poison bran bait or any specific insecticide, even with improved methods of distribution, will fully meet all campaign requirements for grasshopper control. It is obvious, however, that the range of methods has recently been considerably widened and that, even in localities where heavy general infestations have been allowed to develop, individual landholders now have available effective methods for the protection of high value crops and pastures. Further, the development of a fully effective method would be the first step only towards the solution of Australian Plague Locust control in this State and, as in the past, effective organisation and co-operation of all landholders in the location and treatment of swarms developing in the major outbreak areas is the keystone of the problem.

The major outbreak areas for the Australian Plague Locust have been estimated[12] to cover approximately 15,000 square miles, and an additional area of 30,000 square miles is also of importance and may, in some years, be concerned in the development of locust plagues.

Summary.

Poison bran bait, and particularly the benzene hexachloride mixture, is very effective under favourable conditions, but the baiting method of grasshopper control is not popular with many landholders. Bran baiting, however, still remains the accepted method of control in all countries where organised campaigns are carried out, though increasing attention is being directed to other methods.

The advent of the newer insecticides, particularly Chlordane and benzene hexachloride and, possibly, Toxaphene and D.N.O.C., has made possible an approach to direct control of grasshoppers, whether it be for prevention of crop damage or destruction of massed swarms of 'hoppers in grazing country.

Direct methods of control have a number of advantages over baiting, in which success is largely dependent on the favourable operation of a number of factors. The choice of any method of direct control must be governed by the cost of equipment and insecticides, problems of labour and transport and the general policy laid down by the control campaign authority.

The wartime development of D.D.T. dispersal from aircraft for control on a large

Dust Application by Helicopter.
Avoids many hazards and drawbacks associated with the use of planes.
[*After Kelley* (Agricultural Chemicals).

scale of mosquitoes and other pests naturally drew attention to the possibility of adapting this method for use against grasshoppers.

Tests carried out in this State suggest that the aerial distribution of insecticides is more suited to crop protection than the control of 'hopper swarms in grazing country which often presents difficult flying conditions.

The use of insecticidal fogs which may be drifted over massed 'hopper swarms has indicated an effective modern method of control. Recently developed ground equipment for producing these fogs overcomes the many hazards and disabilities associated with the use of either fast- or low-flying planes. Some of these difficulties would also be eliminated by the use of helicopters.

Chlordane may be used very effectively in dust, spray or aerosol form and the actual method of application is relatively unimportant provided an even coverage of 1-2 lb. of insecticide per acre is obtained.

Benzene hexachloride, at 1-1½ lb. per acre, was outstanding as an aerosol for the treatment of massed swarms. It was also satisfactory as a spray, though somewhat unreliable as a dust.

No one insecticide or method will immediately fulfil all requirements affecting grasshopper control or campaign policy, nor is the poison bran bait necessarily outmoded. It is certain, however, that the newer insecticides, which combine contact, stomach poison and residual effects, will play an increasingly important part in future grasshopper control campaigns, and that protection of individual crops over a comparatively lengthy period is now practicable.

Acknowledgments.

The writers are particularly indebted to Lister Blackstone Pty. Ltd., and to Dangar, Gedye and Malloch Ltd. for assistance in making available skilled personnel and the TIFA machine for the numerous fogging trials. Chlordane, an insecticide not yet commercially available in Australia, was provided in quantity by Houghton and Byrne Pty. Ltd. Various Inspectors of Stock, and in particular Mr. R. Jones, of Forbes, assisted in many of the tests described, and their co-operation is gratefully acknowledged.

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Full-time Instructors in Bee-farming Appointed.

FULL-TIME instructors in bee farming have been appointed in the southern, northern and western districts of New South Wales. In making this announcement, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said that these appointments would provide an improved service to the bee-farming industry in both educational and apiary inspection work, which part-time apiary instructors could not deal with effectively.

For the information of bee farmers the addresses of the officers concerned will be as follows:—

Mr. A. A. Clemson, H.D.A., Livestock Officer (Apiculture), P.O. Box 103, Wagga.

Mr. B. Higginbotham, H.D.A., Livestock Officer (Apiculture), c.o. Post Office, Tamworth.

Mr. N. C. Cutts, H.D.A., who has been appointed to the western districts, with headquarters at Bathurst, is at present completing a special course of training in the Hawkesbury Agricultural College Apiary and is expected to take up duty at Bathurst during the coming spring.

New and Revised Edition of "Trees of New South Wales."

A SECOND edition, greatly enlarged and revised, of "The Trees of New South Wales," by R. H. Anderson, B.Sc.Agr., Chief Botanist and Curator of the Sydney Botanic Gardens and National Herbarium, and Lecturer in Forestry at the Sydney University, has been issued. It is now available at the price of 17s. 6d., plus 9d. postage, from the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

This most useful book contains 453 pages of descriptions, illustrations and identification keys to all trees found in New South Wales.

Trees are described and indexed according to their species and to the division of the State in which they occur. A key map is included. Full botanical descriptions of all trees are given, also particulars of uses and any special points of interest concerning each tree. A complete glossary is included.

"The Trees of New South Wales" is unsurpassed as a reference book on trees and timber. All information contained in the book is completely up to date and set out in the most convenient possible manner.

Tropical Fruit Research Station to be Established.

APPROVAL has been given for the establishment of a research station on the North Coast for the purpose of conducting investigations into all aspects of tropical fruit culture.

Making this announcement the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that officers of the Department of Agriculture and representatives of the Banana Growers' Federation Co-operative Ltd. would carry out a survey of the Far North Coast at an early date with a view to locating a suitable site for the erection of the research station.

Mr. Graham said he was pleased to acknowledge an offer by the Banana Growers' Federation Co-operative Ltd. of a grant of £5,000 towards the cost of the project. "This offer is greatly appreciated and is an indication of the importance which growers attach to the development of their industry on scientific lines," added the Minister.

It was now generally realised that agriculture in all its phases was a highly scientific calling and that further improvement in primary production was almost impossible without the assistance of the latest scientific knowledge. "My constant aim is to develop the New South Wales Department of Agriculture along these lines," said Mr. Graham.

Appointment of Additional Poultry Officers.

THE appointment of two new Junior Livestock Officers to the Poultry Branch of the Department, announced by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), brings the number of poultry officers to a total of ten.

The new appointees are Mr. H. W. Burton, H.D.A., and Mr. M. C. Randall, H.D.A. Mr. Burton will be stationed at the Poultry Experiment Farm, Seven Hills, to assist in carrying out the wide programme of research work already under way at that Farm, and Mr. Randall will go to Wagga Experiment Farm. This latter appointment will relieve the senior officer at Wagga of much routine work and enable him to devote most of his time to carrying out district instructional work. It was felt that the expansion of poultry farming and turkey raising in the Wagga district in recent years justified the appointment of a full-time district poultry officer.

THE

BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics.

THE WORLD WHEAT SITUATION.

Supplies Increase—But Demand Still Heavy.

THERE is, at last, a glimmer of hope in the world wheat situation. The latest news from Europe and North America gives some indication that, with the 1948 Northern Hemisphere crops now being harvested, the acute shortage experienced since the end of World War II may be alleviated to some extent before the end of 1948. However, wheat and all other grains are still likely to remain in short supply for some considerable time. The improved 1948 crop prospects, while an indication of a brighter future for the many millions for whom wheat is a basic food, do not mean that supply will overtake demand this year, or next, but merely that, from the consumer's point of view, the position is improving.

It has recently been suggested in overseas quarters that a wheat surplus might develop during 1948-49. An analysis of the figures on which this forecast was made indicates that while production may be sufficient to meet present rationed demand, and, in fact, may even exceed it, there is an effective demand for a much greater quantity of wheat than is or has been available in recent years. It is doubtful if the anticipated 1948-49 world harvest, good as it is expected to be, will allow of the lifting of bread rationing in all European countries.

The significantly improved supply position is likely, however, to cause some fall in open-market prices in the near future, but there is nothing in the present world supply demand picture to justify the assumption that there will be a disastrous fall in world wheat prices within the next two to three years. By "disastrous fall" is meant a fall to levels which would be unprofitable to the great majority of Australian wheatgrowers.

It is notoriously difficult to forecast the future of the wheat market far in advance, but all the information available to-day indicates that, short of a succession of exceptionally high yields in all the major wheat-producing countries, the Australian wheatgrower can expect a payable price for all the wheat he is able to grow in this and the next two seasons.

The Improved World Outlook.

In summary, the following factors have contributed, or are contributing, to a generally improved outlook for the supply of wheat in the future:—

(i) A substantial improvement in European crop prospects for 1948.

(ii) Another 1,000 million crop in the United States (the fifth in succession, but only the sixth on record).

(iii) The record crop recently harvested in Australia and a crop in Argentina much above expectations.

(iv) An improvement in the world rice supply situation.

Demand Will Remain Heavy.

But, in spite of some increase in the world supply of wheat, there is no evidence to indicate that sufficient wheat will be produced in the near future to meet effective world demand.

Despite the fact that European production is expected to be considerably higher in 1948 than in any year since 1939, it will still be less than the pre-war average. On the other hand, the need for wheat in Europe is, and will continue to be, much greater now than it was pre-war.

Turning to Asiatic countries we find that they are also extremely short of wheat and rice, one or other of which is of even more importance in the diet of the majority of Asiatics than is wheat or rye in Europe. A Committee of the Food and Agriculture Organisation has estimated that the world production of rice will not be sufficient to meet effective demand until 1952, and until that time large, but decreasing, quantities of wheat will be used as a substitute for rice, if available. It must not be forgotten that the population of Asia is also increasing rapidly—the population of India alone has increased by about 40 million persons since 1939. Even if the very low pre-war standard of living is maintained in Asia a substantially increased potential demand exists for cereals.

Finally, it is perhaps well to remember that the United States is enjoying its fifth consecutive 1,000 million bushel crop, although the average pre-war crop was only 716 million bushels. The increased production of the past four years or so has been due partly to the increased areas harvested, but also to a significant increase in the yield per acre, due largely, although not entirely, to an exceptional run of good seasons. It is perhaps too much to expect that such yields can continue indefinitely. The significance of the foregoing will be realised if consideration is given to the facts that—

(i) If U.S. wheat production were to revert to the pre-war level she would have no wheat available for export (assuming the current rate of domestic consumption were to continue);

(ii) In the current crop year the U.S. will be responsible for over 50 per cent. of the total world wheat exports. Her exports in this period are expected to amount to nearly 500 million bushels—more than the Australian and Argentine crops combined.

Thus, everything considered, there is good reason to believe that demand for wheat will exceed supply for some time to come.

Wheat Prices—Present and Future.

There is no longer any world parity price for wheat. Most wheat is sold on a Government to Government basis, much of it under contracts of several years' duration. Differential prices are common, and at the time of writing Australia was supplying wheat at four different prices, at least, to:

New Zealand, at 6s. 4d. per bushel.

United Kingdom, at 17s. per bushel.

India, at 18s. 6d. per bushel.

All other wheat at 20s. 6d. per bushel (f.o.b.).

Australia is by no means the only country selling wheat at several different prices, and the fact that a world parity price no longer exists can be further demonstrated by quoting leading exporters' prices (early June quotations—prices are f.o.b.) for wheat other than that sold under contracts already referred to:

	Per Bushel. s.	d.
Canadian	17	0¾
Argentine	30	3
Australian	20	6

The Australian export price has risen consistently since the early war years. At the outbreak of war the price was approximately 2s. 6d. per bushel. The rise was particularly spectacular in 1946 and 1947. On January 1st, 1948, the Australian Wheat Board's price was 19s. 5¼d. for bulk wheat, f.o.r. principal ports; this price was increased to 20s. 5¼d. on January 16th and has since remained at that figure.

The world supply/demand situation outlined above would suggest that wheat export prices are hardly likely to increase in

the future; rather may they be expected to fall. On the other hand, Argentina is demanding, and obtaining, nearly 10s. per bushel more than Australia for her wheat, and if Australia liked to drive a hard bargain she might obtain a higher price for her wheat than she is at present receiving. But such a price, irrespective of any International Agreement, would be only of a very temporary nature.

There can be little doubt that, unless completely unforeseen circumstances arise, the price of wheat will begin falling in the near future. It is not suggested that that fall will be substantial and rapid, or that prices will fall below those fixed in the International Agreement as a maximum in the first year of that Agreement; this hardly appears likely. The International Wheat Agreement and its effect on wheat prices are considered in the article which follows.—P. C. DRUCE, Economics Research Officer.

THE INTERNATIONAL WHEAT AGREEMENT.

"RECOGNISING *that there is now a serious shortage of wheat, and that later there may be a serious surplus;*

"*Believing that the high prices resulting from the present shortage and the low prices which would result from a future surplus are harmful to their interests, whether they are producers or consumers of wheat; and*

"*Concluding therefore that their interests, and the general interest of all countries in economic expansion, require that they should co-operate to bring order into the international wheat market . . .*"

three wheat exporting countries and thirty-three wheat importing countries have reached an agreement, the object of which is stated to be "to assure supplies of wheat to importing countries and to assure markets to exporting countries at equitable and stable prices."

Earlier Agreements.

The major wheat-exporting countries have been discussing ways and means of implementing an International Wheat Agreement, with a main objective of ensuring payable prices to growers, ever since big world surpluses of wheat piled up in the early 'thirties; and in fact in 1933 an agreement was signed. It was effective, however, for less than one year and despite further conferences in 1938 and 1939 no further agreement was reached until 1942 when a provisional agreement was concluded between the Governments of the United Kingdom and the four major wheat exporters—Canada, Argentina, U.S.A., and Australia. It was intended that this agreement should come into operation within six months of the end of World War II. However, the 1942 agreement was concluded at a time when wheat surpluses had reached record levels, and conditions were so vastly different when hostilities ceased that the agreement was never implemented. Negotiations arising out of it, however, have continued for the past two years, despite the fact that Argentina, the world's third largest wheat exporter, withdrew from the discussions early in 1947. The present agreement is the outcome of those negotiations.

The Terms of the Agreement.

The three exporters—the United States, Canada, and Australia—agree to supply the quantities of wheat set out below at certain minimum prices in each of the next five years, commencing August 1st. The United Kingdom and thirty-two other importing countries agree to purchase, at a fixed maximum price, certain quantities of wheat in each of the next five years. The total quantity of wheat involved each year is 500 million bushels. Wheat over and above the allotted quotas may be sold freely at the ruling market price.

The quantities guaranteed by the exporting countries are as follows:

	Million bushels.
Australia	85
Canada	230
United States of America	185
Total	500

There are provisions for modifying exporters' quotas in the event of a short crop or other exceptional circumstances.

The Price.

Prices are fixed in Canadian currency and are for No. 1 Manitoba Northern wheat in store Fort William/Port Arthur. The maximum price in each year is 2.00 dollars. The minimum price is 1.50 dollars in the first year and falls 10 cents each year to 1.10 dollars in the last year of the Agreement.

In Australian currency the equivalent maximum price will be approximately 12s. per bushel, f.o.b., but this price will vary depending on the proportion of the crop sold to India and other near-Eastern markets (in which the grower will receive a slightly higher return when the price is at the maximum level), and to the United Kingdom. The destination of the wheat sold will not affect returns when prices are at their minimum. The minimum price in the first year is equivalent to approximately 8s. 6½d. Australian and, in the last year, to approximately 6s. per bushel. It should be noted that prices may move freely between the maximum and minimum limits, and that during the last three years of the Agreement the maximum and minimum prices may, in certain circumstances, be varied *within the limits prescribed*.

Stocks.

The agreement makes provision for the maintenance by exporters of reserve stocks which must not be less than 25 million bushels in the case of Australia, 70 million bushels in Canada, and 170 million bushels in U.S.A.

It is also intended that both exporters and importers should accumulate what are termed "price stabilisation reserves" in the event of the free-market price falling below the guaranteed minimum price.

British Comment.

At this stage it is very difficult to prophesy whether the Agreement will prove advantageous to the Australian wheat grower or not. Many conflicting statements have been made and readers are no doubt conversant with the main arguments put forward both for and against the Agreement; in any case, it is not intended to enter into a discussion on this point here. It is, however, of interest to note the views put forward in that influential London journal *The Economist.* These views are of particular interest in that the United Kingdom has undertaken to buy 180 million bushels of wheat each year during the period of the Agreement and is, in fact, by far the most influential of the importing parties to the Agreement. As might be expected, the views put forward by *The Economist* are quite different from the views commonly expressed by leaders of the wheat industry in this country.

In the March 27th issue of *The Economist* it is stated:

"When a country (Great Britain) has hitherto pursued, as a major economic interest, the purchase of imported wheat as cheaply as possible, a reversal of that policy, when prices are high, must be put to the closest scrutiny. In Britain's pre-war experience, wheat was relatively cheap for much longer periods than it was relatively dear.

"One obvious limitation of the new agreement is the minimum price schedule and its gradual reduction during the next five years. A price span of 50 cents a bushel in the first year seems scarcely adequate to cover even the normal seasonal fluctuations in the wheat market, and importers would undoubtedly have preferred a fixed minimum level of 1.10 dollars for the whole period.

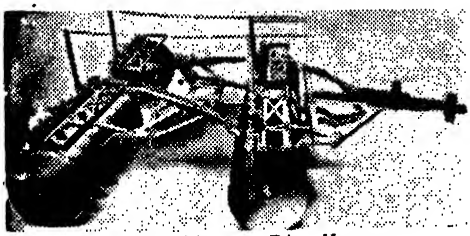
"The minimum price in the first year is not merely of academic interest, for although the current price of wheat in Chicago is 2.40 dollars a bushel, the prospects of a harvest in the United States of perhaps 1.2 billion bushels this year, following good crops in the Southern Hemisphere and the likelihood of a greatly-improved harvest in Western Europe, suggest that even if the wheat market does not fall abruptly, prices may in due course be well under rather than over 2 dollars a bushel. . . . From Britain's point of view, perhaps, there is not much to lose from the agreement in the first two or three years. . . . But the advantages in later years after these long-term contracts have expired are perhaps more questionable. . . . Not until the later years of this agreement will it be possible to decide whether Britain threw away an

(*Continued on page 356*).

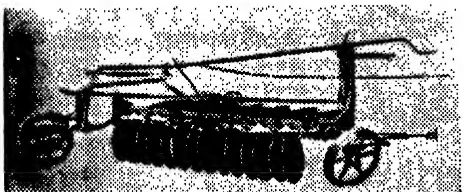
GL186-24

INTERNATIONAL HARVESTER

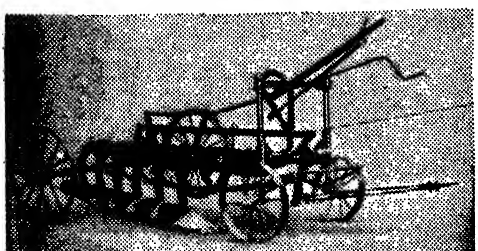
McCormick-Deering Model W-6 Tractor



GL-9A Tractor Disc Harrow



GL-90 Stump-Jump Disc Cultivating Tractor Plough



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CELERY FROM THE MURRUMBIDGEE IRRIGATION AREA

Marketed in Sydney.

NEED FOR EFFICIENT METHODS OF HANDLING.

C. E. PURDUE, H.D.A., Agronomist.

IN a trial carried out last season, from Leeton Experiment Farm, it was demonstrated that celery can be successfully marketed in Sydney from the Murrumbidgee Irrigation Area provided that handling of the crop during marketing is efficient and speedy.

The experiment was conducted in conjunction with a trial to demonstrate the possibilities of commercial celery production on the Murrumbidgee Irrigation Area.

Small consignments were despatched to the Sydney market. The following handling methods gave the best economic returns and resulted in the produce arriving on the market in a most satisfactory condition.

Field Handling.

Just prior to cutting, the crop was given a light irrigation so that its moisture content would be high enough to prevent rapid wilting during the time between cutting and arrival on the housewife's table. Cutting was delayed until as late in the day as possible so that operations would be carried out under comparatively cool conditions. This lessened the risk of excessive wilting from exposure to the hot sun.

The plants were cut by severing at ground level with a sharp spade, immediately trimmed of all surplus root and leaf growth and packed loosely into crates. Just sufficient of the old, bruised, discoloured or split stalks were removed so that the bunch would be still protected with stalks which were removed at a later trimming operation. The trash was left to be ploughed in. The tops of each stalk were trimmed to the length of the crate. The crates were transported as soon as possible to the local cannery cool stores. The time between harvesting and placing in the cool store was as short as possible, as it is length of time in the field which deteriorates the final product. The local cannery co-operated in these experiments by handling the product from the time of cutting to placing on the train for transport to market.

Pre-cooling.

It was found that by cool storing the celery over night at a temperature of approximately 50 deg. Fahr., it opened up the next morning as crisp and fresh as when growing in the field; the practice of pre-cooling of this and any other similar perishable vegetables

Celery Harvesting Operations.
Heads are roughly trimmed in the field.

before marketing over long distances appears to be worth while.

Trimming.

After emptying the celery on to long sorting tables, the bunches were trimmed of

Close-up of Celery at Leaton.

The variety is South Australian Great White, and blanching paper has been removed from one side.

all surplus green, discoloured, injured or over-mature stems, leaving a compact, evenly-balanced crisp bunch. The bunches were then topped to minimise the number of leaves, and this in turn reduced the evaporation capacity so that a minimum of moisture would be transpired from the plant during transit.

Washing.

A certain amount of dirt which was still adhering was removed by rotating each bunch in a battery of high-pressure water jets.

Packing.

After washing, the bunches were placed on an endless conveyor belt and conveyed to packers. Here the celery was packed into cases according to size and grade, the size and grade being carefully recorded and placed on the end of each container.

It was found that the smaller-sized bunch, ranging in pack from 26-32 per crate, gave the best return. The large bunches of 16-18 pack were not so much sought after.

Every care was taken to see that the product was not damaged in any way and was exposed to the light as little as possible. Paper envelopes were not available and were not used, but results indicated that they may not be necessary.

The consignment opened up in a very acceptable condition and was of the highest quality. This was borne out by the fact that it was sold at the highest market price for the particular day of sale.

Holders of .303 Rifles and Ammunition.

THE Chief Secretary has announced that following upon receipt of complaints from many country land owners that they could not obtain efficient substitute rifles for .303 rifles to enable them to destroy pests, etc., on their properties, Cabinet had recently given consideration to the provisions of the Police Offences (Firearms) Amendment Act which made it an offence for the public generally to be in possession of .303 rifles and ammunition. As a result, it had been decided that in view of the fact that substitute rifles are being manufactured to replace .303 rifles and that adequate supplies are not yet available, country owners of .303 rifles should contact the Chief Secretary with a view to informing him that they desire to hold the .303 rifles until such time as substitute rifles can be obtained for the destruction of pests, etc., in country districts.

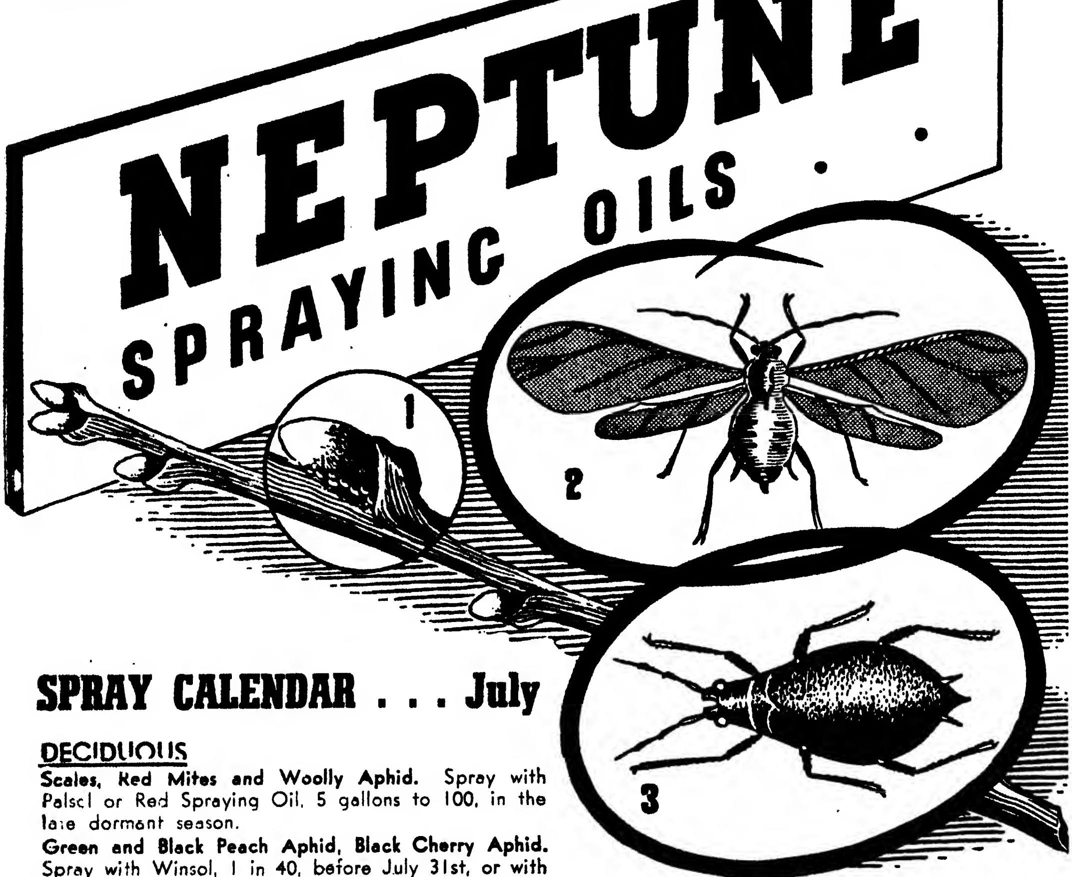
Mr. Baddeley stated that following on Cabinet's decision in the matter, any country owner of a .303 rifle who required it for the purpose of destruction of pests, etc., on his property, should contact the Department immediately.

Business of Farming—*continued from page 354.*

opportunity of buying food in the cheapest market or whether, instead, it reached a satisfactory compromise between its interests as an importer and the broader interest of stable farm incomes."

We may not agree with *The Economist* but it is worth noting that informed opinion in Great Britain considers the prices as fixed may be too high—not too low.—P. C. DRUCE, Economics Research Officer.

PROTECT YOUR FRUIT CROP with...



SPRAY CALENDAR . . . July

DECIDUOUS

Scales, Red Mites and Woolly Aphid. Spray with Palsol or Red Spraying Oil, 5 gallons to 100, in the late dormant season.

Green and Black Peach Aphid, Black Cherry Aphid. Spray with Winsol, 1 in 40, before July 31st, or with Aphidol, 1 in 40, in the late dormant season.

CITRUS

White Louse. Spray with Neptune Lime Sulphur plus Neptune Casein Spreader.

PRUNING

While pruning, watch for pests and diseases and consult the orchardists' illustrated handbook "Clean Fruit," published by Neptune, for identification and control measures.

Be prepared for your dormant, semi-dormant and summer spraying by ordering now from your local Neptune agent your requirements of the following Neptune sprays:—

PALSOL CLARIFOL APHIDOL
WINSOL LIME SULPHUR SOLUTION
PREPARED RED SPRAYING OIL 'A' AND 'C'
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GREEN PEACH APHID

1. *Eggs of Green Peach Aphid in Axil of bud.*
2. *Winged Female Green Peach Aphid (greatly magnified).*
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FRUITGROWING.

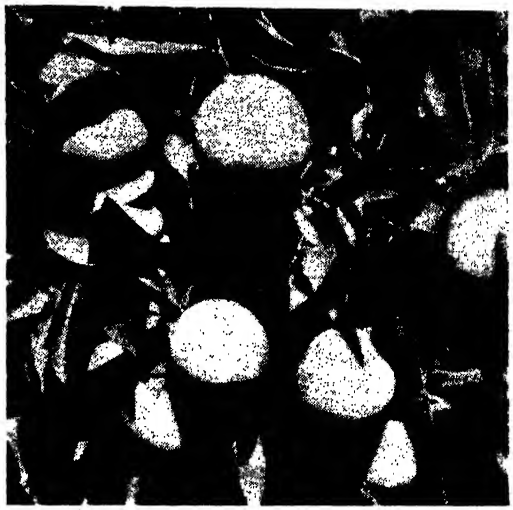
CITRUS FRUIT QUALITY.

What are the Main Considerations?

◆

R. G. KEBBY, Special Fruit Officer, and

A. H. SKEPPER, H.D.A., Fruit Officer.



Heavy Yield and Good Quality.

IN this article the authors consider those factors which operate both for and against the production of high-quality citrus fruit. The discussion should have a practical interest for all who are associated with the citrus industry, particularly in view of the concern being expressed that quality should be watched very closely as a highly important consideration in the economic future of the industry.

Is Fruit Quality Declining?

Periodically the suggestion is made that there is a general downward trend in the quality of our citrus fruit. These statements should be treated with the greatest reserve when applied to a district or the State as a whole. It is remarkable how such assertions regularly coincide with those years when things go wrong at the marketing end.

In our experience, in the principal citrus districts of New South Wales, present average quality is not showing a tendency to decline. In fact, results of grade tests conducted by our inspectorial staff indicate that juice and acidity, together with general appearance, compare quite favourably with fruit of other years.

Admittedly, there are individual groves where fruit quality is not up to standard, and in these cases we can usually place a finger on the cause and prescribe corrective treatment. Seasonal conditions will, of course, produce quality variations on a district basis but such variations have occurred throughout the history of the industry, and must not be confused with long-term quality trends.

Too much attention cannot be given to production methods that will produce the highest quality fruit. Perusal of market reports will emphasise the importance of this. The wide variation of price in any one day's sales is largely due to fruit quality and as this variation may run to several shillings per case, the effect on growers' returns is obvious.

In the development of those export markets, which will undoubtedly mean so much to the future of our industry, we must recognise that nothing short of the best will be good enough. Let there be no misunderstanding in this regard; all reports coming to hand from competent observers on overseas markets indicate, quite clearly, the importance placed on quality standards by other exporting countries.

We must take steps also to insure that handling, packaging and transport methods will be brought up to a standard worthy of that quality.

What is Quality?

Quality in fruit may be described as those characteristics which make the fruit attractive to the consumer. In oranges this may be summed up as fruit of normal shape and of the appearance common to the variety, sound, smooth, fine-textured skin, thin rind, free from rag, juicy, rich in flavour, even colour, free from disfigurements and pest or disease.

Soil and Climate are Important.

Once the orchard is planted, many of the factors which influence quality either cannot be controlled or may only be controlled with much difficulty. Therefore, great care must be taken in the selection of the site. Citrus fruits are sub-tropical and thrive best under conditions where summers are warm, winters not too cold and moisture supply sufficient. If any of these conditions is lacking then the fruit quality will suffer.

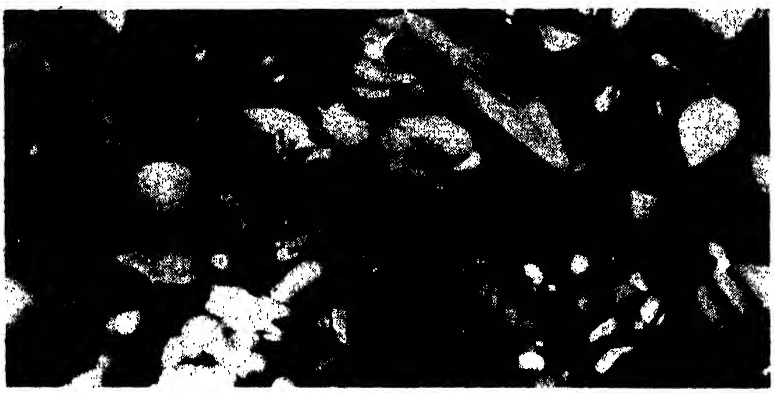
In this State the limiting climatic factors are mainly rainfall and winter cold. In some cases rainfall may be supplemented by irrigation, as along the Murray and on the Murrumbidgee Irrigation Area. Winter cold, however, is not so easily overcome, and in many established citrus districts periodical losses from frost injury are incurred. In addition to fruit discarded because of apparent frost injury, much loss is experienced with fruit that may outwardly appear sound but is below the desired standard in juice content.

Soils and the influence they have on the trees' nutrition are an important contributing factor. Mineral deficiencies and excesses both play their part. Usually deficiencies can be corrected by suitable fertiliser practice. Excesses are more difficult to control. In addition to nutrition the soil has to provide a suitable environment for the trees' roots if they are to function to their full capacity. This means that the soil must be well drained and have good water penetration and water-holding capacities.

Bud Selection.

The citrus industry in this State has been established for over 150 years, and, during that time, the number of varieties grown has been gradually reduced to a few standard varieties selected for their superior quality and cropping. Even amongst these varieties there is variation, and many instances of "off" type trees may be found. These trees may not only be poor quality, but also of poor cropping habits.

In an effort to raise the general standard of our fruit, there came into being, in 1928, the New South Wales Co-operative Bud Selection Society. This Society, operating under the aegis of the Department of Agriculture, has selected trees of the main varieties of citrus for the provision of budwood to commercial nurserymen. These trees were selected after a close recording of their superior quality and cropping habits over a period of years. The better average quality of fruit from our younger groves and the reduced number of "off type" trees to be found in these plantings is largely due to the efforts of this Society.



A Serious Valencia Variation.

Rootstocks.

Important as it is to ensure budwood of proved parentage, the task of raising a tree that will produce the best quality fruit is not yet complete.

Suitability of rootstock is a highly important consideration. In 1940-41 the Division of Horticulture carried out detailed chemical investigations to determine the effect of three different stocks, namely, Rough lemon, Sweet orange and *P. trifoliata,* on the quality of Washington Navels, Valencias and Marsh grapefruit. Fruit for this investigation was obtained from stock trial plots at Grafton Experiment Farm, Hawkesbury Agricultural College, and Leeton Experiment Farm. Mr. E. G. Hall, who carried out this investigation, reported* as follows: "In spite of some minor inconsistencies, the best quality fruit of Navels, Valencias and grapefruit came from trees on *trifoliata* stock, which was often highest in acidity and was in nearly all cases highest in soluble solids in the juice and in flavour."

Valencia on *P. trifoliata* Stock.
Nine years old.

Unfortunately, Washington Navel oranges, when worked on this stock, produce a percentage of dwarf trees which cannot be regarded as satisfactory commercial units. Research has shown that this dwarfing is invariably associated with a condition known as "Scaly Butt," and the Department has established an intensive research programme in an endeavour to overcome this problem. Until such time as it is possible to ensure the maximum percentage of successful trees, this stock cannot, of course, be yet recommended as a commercial proposition for Washington Navels.

* *Agricultural Gazette* April, 1943.

Broad-based Irrigation Furrows.

This condition is also present with Marsh grapefruit to some extent, but the improved fruit quality obtained more than offsets this defect.

In the case of Valencias, mandarins, and Wheeney grapefruit, *trifoliata* has demonstrated its ability under our conditions to produce a tree comparable with other stocks, and now occupies an important position in younger areas of these varieties in New South Wales.

The age of trees has a decided influence on quality and this is particularly noticeable with Rough lemon stock. Young, vigorously-growing trees usually produce large, coarse fruit in the early crops, and it is some time before they settle down to production of good-quality fruit. By comparison, *trifoliata* produces high-quality fruit in the very early crops; it is of interest that the two major prize-winning entries

The Soil Auger Guides the Way.

in Valencia classes at the 1947 Griffith Agricultural Society Show came from two- and three-years-old trees on *trifoliata* stock.

From the foregoing it is obvious that rootstock is a major factor influencing quality. While we have the results of many

Drought-affected Valencia Orange.

years of investigational work upon stocks, there still remains a colossal field for further research, and large-scale stock trials are now projected for coastal and inland conditions.

Farm Practice.

On established citrus groves, the task of improvement and maintenance of yield and quality is unending. In this case the selection of site, soil, scion and stock has already been made. The job is to make full use of the material on hand and develop to the full all the good inherent qualities of the tree. This involves all farm practices, including cultivation, cover cropping, irrigation, fertiliser practice, together with pest and disease control.

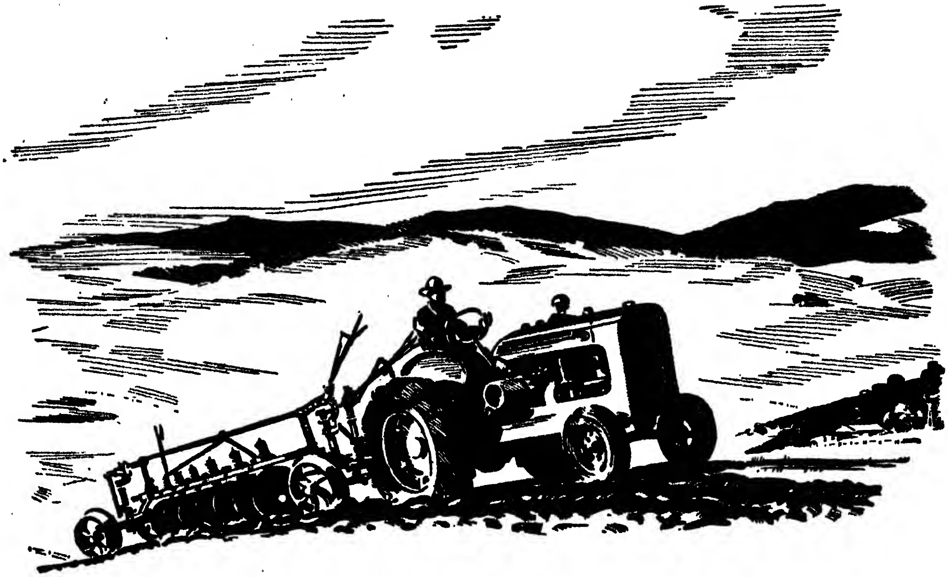
Cultivation is important from several aspects. Excessive and ill-timed cultivation can ruin the physical properties of the soil, destroying soil structure and making conditions favourable to the development of soil erosion. Soil that has lost its structure sets hard, retards and even prevents penetration of moisture into the soil and adversely affects the development of the root system of the tree. This upsets the ability of the tree to make full use of the soil nutrients and reduces tree health. This in turn can result in a falling-off of fruit quality.

Lack of cultivation can, on the other hand, and particularly in dry seasons where irrigation is not available, result in excessive competition by weed growth for available moisture and plant-food to the detriment of the tree. The ideal is to aim at the minimum amount of cultivation necessary for control of weed growth in (*a*) their competition with the tree for soil moisture and plant foods, and (*b*) their influence on the efficient control of irrigation water within the grove.

Cover crops are grown primarily to offset the ill effects of cultivation and provide a cheap supply of organic matter to the soil. Efficient cover cropping may maintain and, in some cases, improve, the soil conditions —which is reflected in better tree health.

Irrigation should aim at supplying water to the root-zone area of the soil only when the trees are in need of water. The root-zone rarely extends below 2 feet 6 inches from the surface and frequently, on heavier soils, is confined mainly to the top 20 inches of soil. Excessive irrigation below this depth is not only wasteful of water, but also in time may lead to the development of water-logged conditions, with consequent reduction in tree health and fruit quality. Frequency of irrigation is determined by the size and vigour of the tree, climatic and soil conditions. The only way to determine when a tree needs water is by use of the soil auger, together with a close observation of the tree's condition.

When the tree is approaching its wilting point is the time to apply water, not after the tree has wilted. This is most important in our irrigation areas, as experience has shown that adequate soil moisture must be maintained continuously throughout the irrigation season. In some cases, individual amounts of water applied are inadequate, and, in others, too long a period is allowed between waterings. In recent years, also, an element of doubt has crept into some growers' minds about the advisability of putting on a late autumn watering in case a wet winter is experienced. We have recorded some very unhappy results from the over-cautious attitude in this regard, reflected in deterioration of juice content and total solids, thick rinds and heavy rag. Our



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advice has always been to let the soil auger be the deciding factor in whether to water or not. The fact that a tree enters the winter in a dry condition and that winter turns out to be wet, is no criterion that it will emerge in the spring in any better condition than the tree which has been kept growing steadily with judicious and controlled applications of water until the last available irrigation.

Under conditions where soil moisture is not properly maintained during the spring blossoming and early fruit setting period, we usually experience a serious dropping of main crop blossom and fruit. In the event of relieving rains, further fresh blossoming occurs and so a percentage of "second crop" fruit is set. Under such fluctuating soil moisture conditions it is possible to have some three or four settings of fruit in the one season. This fruit never attains the quality or appearance of normal main crop fruit, but only succeeds in lowering the general quality standard for the grove and even for the locality or district, under extreme conditions.

Provision for supplementary watering seems to be the best insurance policy the grower can hold against this problem, and, while he will probably never entirely eliminate it, the problem can be brought to perhaps an irreducible minimum.

Fertilisers are applied in order to correct any deficiencies of plant nutrients in the soil. These requirements will vary considerably in relation to districts and individual blocks, so that no hard and fast recommendations can be laid down that will meet all situations. However, maintenance of the nitrogen level is a universal problem, and nitrogen, in the form of sulphate of ammonia, forms the basis of all fertiliser programmes recommended by the Department.

In addition to the major plant-foods—nitrogen, phosphoric acid and potash—it is becoming increasingly important to recognise the need for maintaining correct levels of the "trace elements" such as zinc, copper, manganese, magnesium, and many others. These deficiencies are particularly common on the light, sandy soils of the coast and inland citrus areas, and are a problem to be reckoned with. The effect on tree health and fruit quality is often spectacular. While they can be corrected by the supply of the required chemical, either by spray or soil application, it should be noted that care must be exercised, firstly, in diagnosing the deficiency, and, secondly, by applying the correct amounts in the proper manner. This is important, because trees usually require only a small amount of these chemicals to correct the condition, and excesses can cause severe damage.

Pests and diseases operate in two ways against fruit quality, firstly, by their influence on tree health and vigour, and, secondly, by direct attack and disfigurement of the fruit itself. That the importance of pest and disease as affecting quality cannot be too heavily stressed is amply demonstrated by the ravages of black spot and red scale, to name only two of our major problems.

Satisfactory control of pests and diseases entails the use of correct insecticides and fungicides straight or in proper combination, plus thorough application at the correct times.

Primitive Handling Methods Spell Disaster.

Handling Methods.

Having produced good quality fruit, the next step is to present it to the consumer in good condition, and it is here that we must differentiate between fruit quality and keeping quality. While there is admittedly some connection between the two, it must be recognised that keeping quality is largely influenced by seasonal conditions and handling methods. There is an old saying that

"fresh fruit should be handled more carefully than eggs," and this is a good maxim —for the slightest abrasion to the skin opens the way for entry of moulds and rots which can rarely damage the unbroken skin.

Fruit is subjected to a terrific amount of handling before it reaches the consumer, and there can be no "let up" in observing every care in handling methods right from the grove to the consumer. A few major points for special attention are:—

(*a*) Avoid harvesting while fruit is wet from rain or heavy dew.

(*b*) Pickers should wear gloves to avoid fingernail damage.

(*c*) Fruit should be clipped from the tree, making sure that the stalk is cut flush with the button. Bad clipping is worse than bad pulling.

(*d*) Use clean picking bags, and roll the fruit (not drop it) into cases.

(*e*) Use clean, sound field boxes and don't overfill them.

(*f*) Allow for air circulation when stacking field boxes of fruit.

(*g*) Drivers should keep in mind that they are carting fruit and avoid the bumps, both on the road and in handling.

(*h*) Packing sheds equipment must be maintained at high standards of efficiency and cleanliness. Use sponge rubber whenever possible.

(*i*) Loading operations designed for greater efficiency in handling must combine care with speed.

(*j*) Fruit markets and retail operators will appreciate that the need for careful handling and hygienic conditions have an equal application to their methods at the distribution end.

It has been often claimed that good quality fruit will always create a demand, but from the foregoing it will be seen that the presentation of high quality fruit to the consumer calls for highly developed and sound horticultural practices, aided by skilful and efficient handling methods. There is no room for slacking at any stage of this task if the industry is to maintain quality standards at the highest levels.

Beekeeping Scholarship at Hawkesbury College.

MR. GEO. T. PENDER, of Pender Bros. Pty. Ltd., West Maitland, has donated a sum of £1,000 to Hawkesbury Agricultural College for the purpose of establishing an annual prize and a scholarship in the Agricultural Diploma Course, to be known respectively as the "W. S. Pender Memorial Prize" and the "W. S. Pender Memorial Scholarship."

In making this announcement, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., stated that the annual prize would be awarded for proficiency in apiculture, while the scholarship, which would be of a value of £20 per annum, would be awarded to a selected candidate interested in beekeeping. The first scholarship would be open for competition in January, 1949.

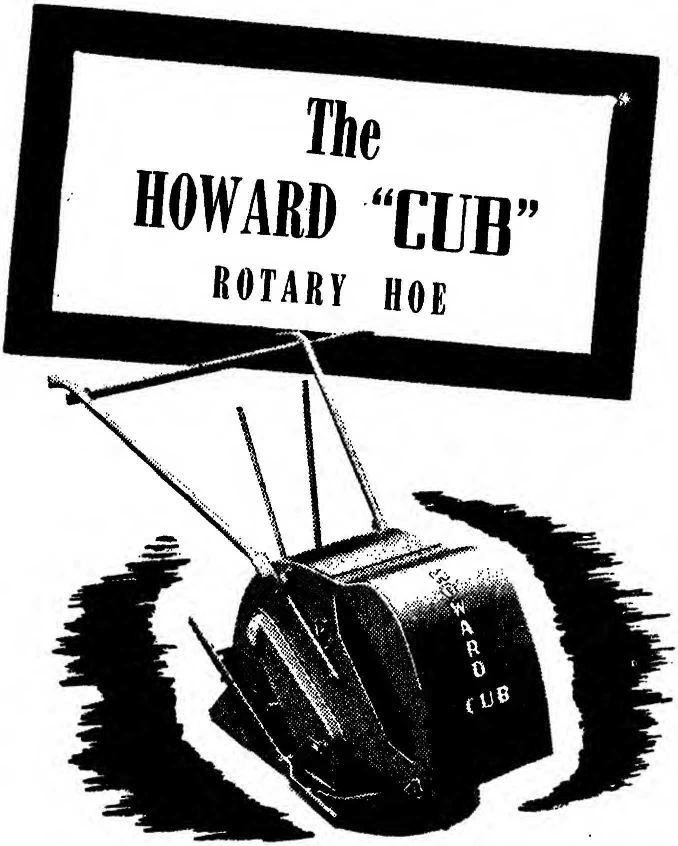
Mr. Graham added that the generous action of Mr. Pender was to be commended, as it would undoubtedly encourage the study of beekeeping—an industry of rapidly-growing importance in this State—and, at the same time, would perpetuate the memory of the late W. S. Pender, who always had at heart the interests of beekeepers.

Site Selected for Gosford Citrus Research Station.

A SUITABLE site for the establishment of the Gosford Citrus Research Station had been located and the Valuer-General was conducting negotiations for the purchase of the land so that the erection of the station could be commenced at the earliest possible date.

In making this announcement, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), said that the site chosen was situated in the Somersby district, near Gosford. It had been selected by officers of the Division of Horticulture, with the assistance of a local committee of three growers whose practical knowledge had been of immense assistance to his Department in the matter. It would be recalled, said Mr. Graham, that, following representations made to him last year by the Hon. F. J. Finnan, M.L.A., Minister for Labour and Industry, on behalf of citrus interests in the Gosford district, approval had been given to the establishment of the research station for the purpose of conducting investigations into citrus culture in coastal areas of New South Wales.

"It is my desire," said Mr. Graham, "to give growers in that area the assistance of the latest scientific knowledge to enable them to deal with problems resulting from disease, loss of soil fertility and other matters affecting their industry."


The
HOWARD "CUB"
ROTARY HOE

PLANT DISEASES

STONE AND POME FRUIT DISEASES.

Winter Control is Essential.

THE control of plant diseases in the orchard is a matter of prevention rather than cure; with stone and pome fruit trees winter precautions are indispensible to a successful spraying programme in the spring and summer.

The 1947-48 season was particularly favourable to the development of fungous diseases which are now hibernating in dangerously high proportions in fallen leaves and fruit, as well as in the twigs and limbs of the dormant trees in practically every orchard in the State. Thus, unless thorough disease control practices are adopted, losses next season will eclipse those of last year, should another wet spring and summer occur.

As long term weather forecasts are, at best, unreliable, orchardists are advised not to gamble on the weather and to assure maximum fruit quality by adopting a thorough programme of plant protection, particularly during the winter and early spring.

ORCHARD SANITATION IMPORTANT.

Destroy Stone Fruit Mummies.

The most important part of the control programme for brown rot of stone fruit is the collection and destruction of all mummified fruits of the previous season or seasons. These mummies are the chief source of the winter carry-over of the fungus. All mummies should be collected from the trees, particular attention being given to the crotch of the tree, where almost certainly many mummies will have lodged. Furthermore all mummies on the ground must be collected, for these constitute the most potent of all sources of infection. The mummies may be destroyed, either by burying to such a depth that they are covered by at least 6 inches of soil, or by burning with the prunings.

Cherry growers will find it impossible to pick up all mummies from the ground, because of their small size. However, they can be collected from the trees, and an effort should be made to collect as many as possible from the ground. To deal with the remainder on the ground growers may

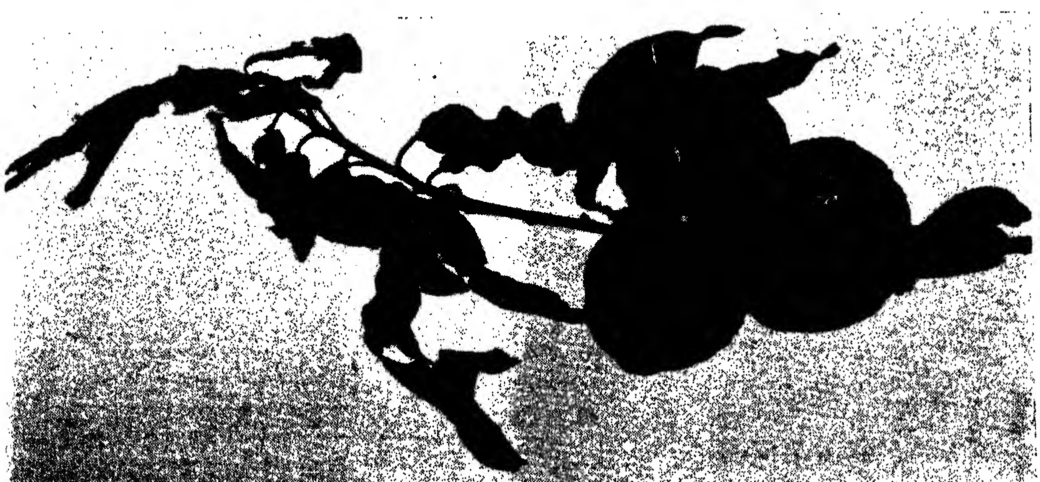


Fig. 1.—Fully Rotted Peaches which will soon be "Mummified."

The surfaces of these fruits are covered with spores of the brown rot fungus. Destroy them before they destroy your next season's crop. Note that the shoot has become infected and has been completely killed. Such shoots are a source of danger and should be promptly removed.

resort to ploughing in an endeavour to bury as many as possible. The ploughing should be as deep as possible (up to 5 inches)

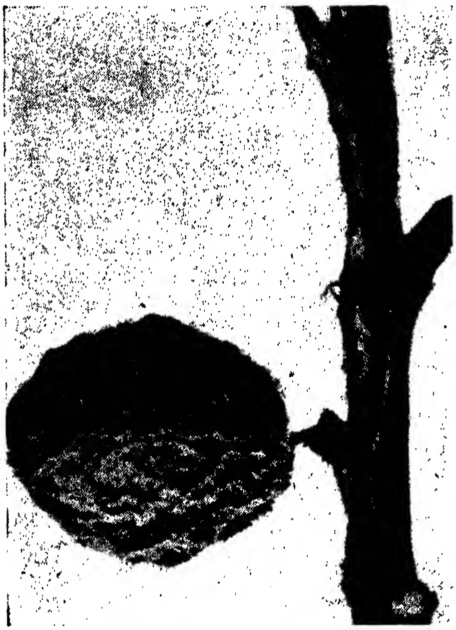


Fig. 2.—Peach " Mummy " Attached to Branch.

If such mummies are not removed promptly the fungus may grow down the fruit stalk and into the branch to form a canker, as illustrated. Quite large branches may be girdled and killed by such cankers.

without causing root injury, and the soil should be cultivated, by hand if necessary, right up to the trunk of each tree.

When ploughing, a large proportion of last season's mummies will be buried, but *many viable mummies from previous seasons will be turned up*. Thus, the ploughing must be done at a time when the blossoms are just about to unfold, so that the trumpet-shaped structures which emit the "spore showers" of the fungus (see Fig. 3) will be destroyed, and those mummies which are turned up will not have time to produce "spore showers" before the completion of blossoming. If any of the fleshy, trumpet-shaped structures are detected subsequently, a light cultivation will destroy them.

Wood Infections.

As the brown rot fungus, and also other pathogenic fungi, such as the rust, leaf curl, shot-hole and freckle fungi can overwinter in infected wood, it is imperative that all dead and diseased wood be cut from the trees and burned. To be sure that these dangerous sources of infection are removed, it is best to collect and burn *all* prunings. To achieve this object, special methods, such as the spreading of hessian under the tree while it is being pruned, may have to be employed. The adoption of any such method to ensure thorough collection of mummies and prunings will pay dividends, should the forthcoming season prove to be a wet one.

SPRAYING ALSO NECESSARY.

Stone Fruits.

The effectiveness of the spraying programme will be directly proportional to the thoroughness of orchard sanitation, or, in other words, proportional to the number of spores which have escaped the cleaning-up process.

If a continuous coating of a fungicide could be maintained on every part of the tree all the time, the fungi would be unable to infect the tree. In practice, however, it is impossible to maintain such a covering of fungicide. By thorough spraying it can

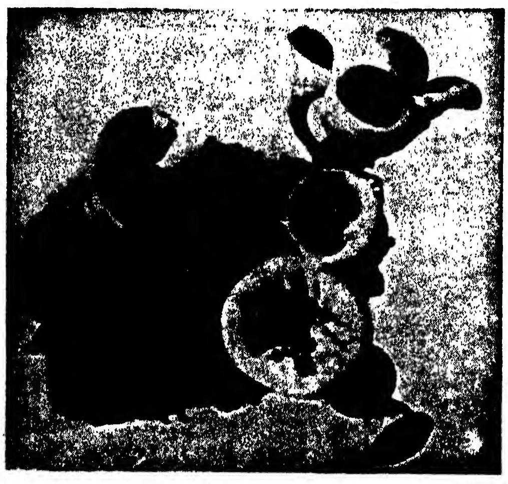


Fig. 3.—A " Mummied " Fruit Bearing a Crop of the Fungous Structures (apothecia) from which a New Spore Generation is Disseminated.

These fleshy, trumpet-shaped structures which measure from one-eighth to one-half inch in diameter, emit "spore showers." These spores are emitted in their millions in spring at blossoming time, and are capable of causing a devastating blossom blight unless trees are adequately covered by a fungicidal spray.]

be achieved for a short period, but the continuous coating is soon broken as the leaves expand or as new growth emerges. The less spores there are floating about the orchard, the more chance there is that this un-

Fig. 4.—Nectarine Leaves affected by the Leaf Curl Disease.
This fungous disease is readily controlled by a single application of Bordeaux mixture spray (15-15-100-½) at early bud-swell.

[*From the Transvaal Agricultural Journal.*]

protected growth will escape infection until it can be covered by the next application of spray.

The most efficient semi-dormant protective spray to apply following the recommended sanitation measures, is Bordeaux mixture 15-15-100 plus ½ gallon of white oil or pale oil. This spray is recommended for the control of all fungous diseases of stone fruits, including brown rot, rust, shot-hole, freckle and leaf curl. It should be applied at the late bud-swell stage, when the first sign of the pink of the blossoms becomes evident. However, if leaf curl was evident last season it would be desirable to apply the spray earlier, when the buds begin to show some rapidity of movement, but before any pink is evident. Last year the shot-hole disease was severe in all districts, and those growers who have applied Bordeaux mixture 15-15-100 plus ½ gallon of white oil at leaf fall should repeat this spray at late bud swell.

Two Sprays for Pome Fruits.

The effectiveness of the spraying programme in controlling black spot, the most important pome fruit disease in this State, is proportional to the timeliness of spraying and the thoroughness of application. At

Fig. 5.—Raised Brownish Scab on Moorpark Apricot. caused by the Shot-hole Fungus.

Such unsightly fruit may be banished from your orchard in two to three years by spraying with Bordeaux mixture 15-15-100-½ at leaf fall in the autumn, and at late bud-swell in the spring. This spray also controls the leaf spot and shot-hole phase of the disease. (*See* Fig. 6.).

Fig. 6.—The Shot-hole Disease of Leaves of Cherry (left) and Plum (right).

Note the brown spots which break away from the healthy leaf tissue as they dry out. Eventually the spots fall out giving the leaf a ragged and shot-holed appearance.

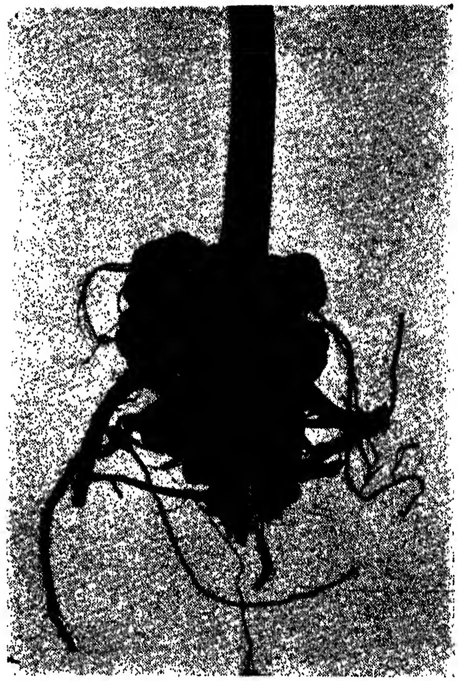


Fig. 8.—Young Peach Tree killed by Crown Gall.

Do not plant trees showing any such rough outgrowths of galls. It is useless to knock off or cut off such galls before planting as they will grow again.

Fig. 7.—Peach Fruit and Wood affected by "Freckle."

Note the infected bark spots (indicated by the arrows) and the close relationship between the bark spots and the fruit spots. The fungus causing this disease overwinters on the young wood, in infected bark, and in spring its spores are washed or splashed by rain to the fruit where they set up new infections. The late bud-swell Bordeaux mixture (15–15–100–½) spray establishes a sound foundation for the control of this disease. All prunings should be collected and burned.

Fig. 9.—Leaves and Fruit affected by the Apple Black Spot Disease.

Note the spotting and cracking of the fruit and the leaf spotting. To avoid such losses, a thorough spraying programme is essential. A sound foundation for the spray programme must be established by spraying with Bordeaux mixture (15–15–100–½) at "green tip" and "spur-burst". If the trees are not adequately protected at these early stages, satisfactory control of the disease will not be obtained by subsequent sprayings.

this stage it is recommended that pome fruit growers should take steps to ensure a good foundation for their spray programmes by thoroughly spraying their trees with Bordeaux mixture 15-15-100 plus ½ gallon of white or pale oil, at the "green-tip" stage, and again at "spur-burst."* Unless a sound foundation is established, the disease can gain such a hold within the trees, at these early stages, that subsequent sprays cannot adequately hold it in check.

In the drier districts, a single Bordeaux mixture spray at "green-tip" should be sufficient, especially in those orchards where black spot caused little or no trouble last season.

Where powdery mildew is a problem, care should be taken to prune out all wood

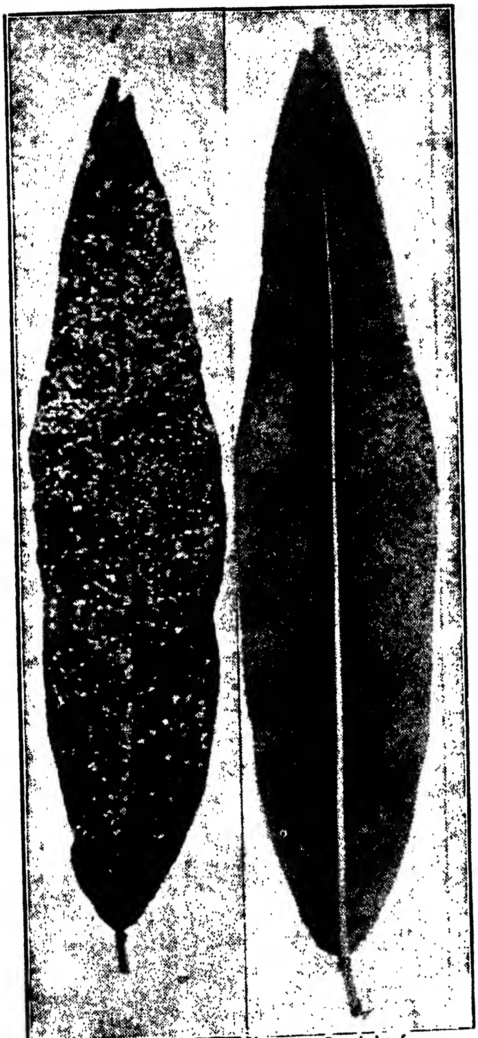


Fig. 10.—Rust Infection on Peach Leaf.

Note the yellow speckling of the upper surface (left) and the brown pustules of rust spores on the lower surface (right). As this fungus can overwinter on infected twigs, all prunings should be collected and burned. To establish a foundation for the rust control spray programme, spray with Bordeaux mixture (15-15-100-½) at late bud-swell.

Fig. 11.—Apple Shoot Infected with Powdery Mildew.

Note the white, flour-like coating of the fungus on the leaves and shoot. The leaves are elongated, in-rolled and narrow. Prevent defoliation and reduction of tree vigour, by this disease, by spraying at the "green-tip" to "spur-burst" stage with lime-sulphur 1–20, thereby establishing a sound foundation for the summer sprays.

*In spraying with Bordeaux mixture at the "spur-burst" stage, care should be taken to avoid spraying once the blossoms are beginning to show pink, for the spray may cause severe russetting of the fruit, if applied at the "pinking" and later stages.

which has carried powdery mildew infection, and to collect and burn the prunings. The spray in this case should be lime-sulphur 1-20 at "green-tip" and Bordeaux mixture 15-15-100-½ at "spur-burst" if black spot has been particularly severe.

Zinc Deficiency.

With both stone and pome fruits which have shown symptoms of zinc deficiency a spray of zinc sulphate 50 lb./100 gallons should be applied before the trees are pruned.

New Plantings.

Orchardists who are making additional plantings this winter should examine their trees carefully and reject any tree showing evidence of crown gall (see Fig. 8).

Information concerning the further treatment of these and other plant diseases may be obtained free on application to the Chief Biologist, Department of Agriculture, Box 36A, G.P.O., Sydney.

TO PREPARE BORDEAUX MIXTURE (15-15-100-½).

A Simple Method.

Materials Required:—

(*a*) Bluestone "snow" (copper sulphate, powdered form).

(*b*) Fresh hydrated lime (purchased for use during the current season. It is unwise to carry hydrated lime over from one season to the next, unless it is kept in a perfectly airtight condition).

(*c*) Water.

(*d*) White oil or pale oil.

(*e*) Spray vat, with copper sieve of fine mesh.

(*f*) Set of scales, preferably of a type which can be hung up and a bucket swung on them.

(*g*) Three buckets.

(*h*) A volume measure for the spraying oil—say, a quart measure.

Method of Preparation:—

1. Weight out 15 lb. of powdered bluestone in a dry bucket or other suitable container.

2. Place the bluestone in the sieve over the opening into the vat.

3. Pour water over the bluestone in the sieve until the vat is almost full. The bluestone will be dissolved by the time the required volume of water has been added.

4. Weigh out 15 lb. of hydrated lime in a dry bucket while the vat is filling with water.

5. Empty the lime slowly from this bucket into a bucket three parts full of water, stirring all the time to make a milk of lime.

6. Start the agitator (and keep it running until the spray has been applied).

7. Add the milk of lime through the sieve. If all the lime has not gone into suspension, add more water to the bucket, and wash through the sieve again.

8. Measure out ½ gallon of white or pale spraying oil.

9. Break down the oil in a gallon or so of water and add through the sieve.

10. Fill the vat with water to make up the "full" level.

The above method of preparation is simple and rapid, and results in the formation of a first-class Bordeaux mixture, with excellent fungicidal properties, which thoroughly covers and adheres to the surfaces upon which it is sprayed.

The Department has received the following advice from the Department of Commerce and Agriculture:

"We have been advised by the Australian Trade Commissioner at Cairo that 620 boxes of apples shipped from Melbourne on *Elizabeth Bakke*, 7th April, have been prohibited entry at Port Said because of the presence of Bryobia Mite. This also occurred in 1947 with apples from Western Australia per *Mongabarra*.

"As it is practically impossible to guarantee apples to be free from red spider or mite, it would appear that the chances of exporting apples to Egypt are slight at best."

FILING covers for the *Agricultural Gazette* are available for the years 1934 to 1947. They are obtainable, price 3s. 3d. each (posted), from the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

INSECT PESTS.

Notes contributed by the Entomological branch.

TREE BORERS.

THE larvae or grubs of many species of native beetles and moths bore into and injure living trees and shrubs. Although some borers may attack trees that are apparently healthy, trees in an unhealthy condition are considered to be more subject to infestation, and weakened trees may be killed.

Amongst the borers most frequently observed are the fig longicorn beetle, the elephant beetle, the fig twig-borer, the auger beetle, the pine weevil, the cypress pine buprestid beetles, the kurrajong weevil, and the fruit-tree moth borer.

The eggs of these insects are usually laid in, or on, the bark, but some of the moths drop their eggs to the ground during flight. Others insert them into deep cracks in the bark by means of their long ovipositors. Some of the grubs feed on the inner surface of the bark and on the sapwood; others may work their way into the heartwood and into the roots.

The Fig Longicorn Beetle
(*Dihammus vastator*).

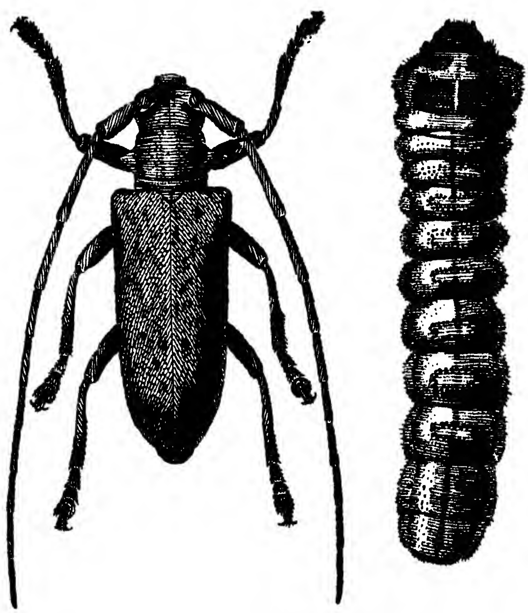
Under natural conditions this beetle seems to prefer native fig trees (*Ficus* spp.) on which to deposit its eggs, and trees that have become decayed, or damaged by storms, appear to be more attractive to it.

Cultivated figs are also attacked, and at times grape vines, passion vines, and wistaria are seriously injured by the larvae. It has also been bred from a dead branch of red cedar (*Cedrela australis*) and from a rock-lily (*Dendrobium* sp.)

When vines are attacked, the larvae may tunnel upward in the stems for 3 or 4 feet before they are fully-fed, or they may burrow down through the main roots. Whole branches of fig trees may be killed by the larvae tunnelling within. In some instances the work of the larvae can be traced by the frass and gnawed wood mixed with exuding gum, which forms hard lumps along the infested branches.

The females lay their eggs singly on the surface of the rough bark, and then gnaw an irregular circle, about ½ inch in diameter, in the bark, around each egg. On hatching, the larva works its way through the bark and into the sapwood beneath. The circular piece of bark dries, and later falls out, leaving a round pit which exposes the sapwood.

The larva, which may measure up to 1½ inches in length, is whitish and somewhat shiny, with a dark brown head and well-developed black jaws. When fully-fed the larva enters its pupal or chrysalis stage in



The Fig Longicorn Beetle and its Larva.

a small cavity at the end of a tunnel, just beneath the bark. The pupa, which is whitish, measures about 1 inch in length. It is somewhat flattened, and broadest across the middle.

The adult is of a general yellowish-grey colour, and measures slightly more than 1 inch in length. The sides of the thorax are produced into spines, and the antennae, in the male, are about three times the length of the body. The adults commence to emerge from the trees during September.

The Elephant Beetle

(*Orthorrhinus cylindrirostris*).

This widely distributed species of weevil, at times, becomes a pest in orchards, where it injures various trees, including apple, apricot, citrus and peach. It also attacks grape vines and has been recorded breeding in brush box (*Tristania conferta*), the Queensland bean tree (*Castanospermum australe*), and gum trees (*Eucalyptus* spp.)

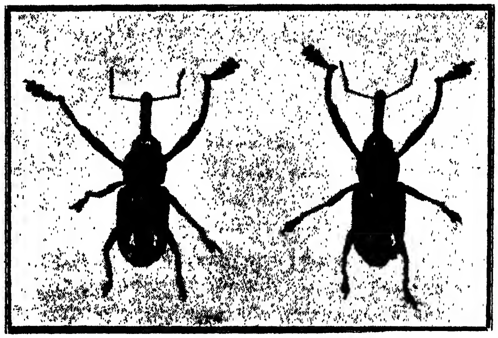
The adults feed on and destroy the young buds of the trees and vines, and eat numerous small areas of the young bark. In their natural surroundings they have been observed to show a marked preference for freshly-fallen timber, when the bark is just commencing to wither.

The eggs are deposited beneath the bark, in a hole bored by the female with its sharp jaws, which are situated at the end of the long snout.

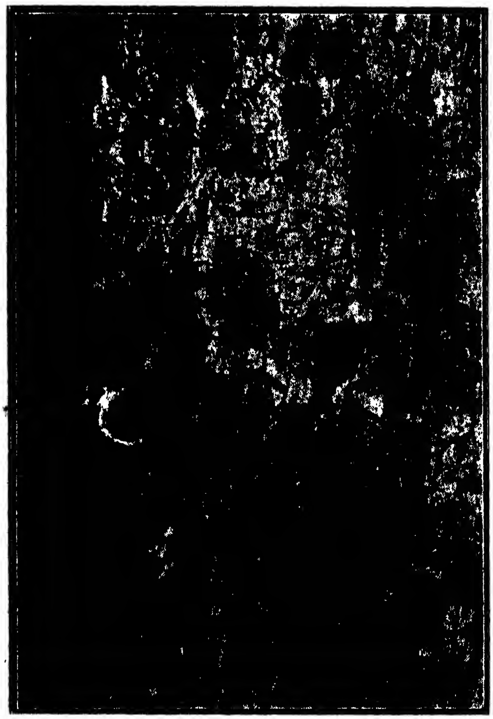
The legless larva or grub, which is soft and fleshy, is light yellowish in colour. It tunnels downwards in the tree towards the roots, and when fully-fed measures about ¾ inch in length. Towards the end of September, the larva forms a coarse cocoon of woody fibres, within its tunnel, and therein enters its pupal stage. The pupa measures a little more than ½ inch in length.

The adults gnaw their way out through the trunk of the tree about October or November, after being in the pupal stage for about three weeks. The circular exit holes, which are about ¼ inch in diameter, are usually to be found at a height of from a few inches above the soil surface to about a foot up the trunk, and in some instances numerous exit-holes of this weevil may be seen in the trunks of individual trees.

The adult weevils vary in size, and range from about 1/3 inch to nearly 1 inch in length. Their bodies are densely covered with minute scales, mostly brown, but varying from grey-brown to black. The wing-



Adult Elephant Beetles.



Emergence Holes of the Elephant Beetle.

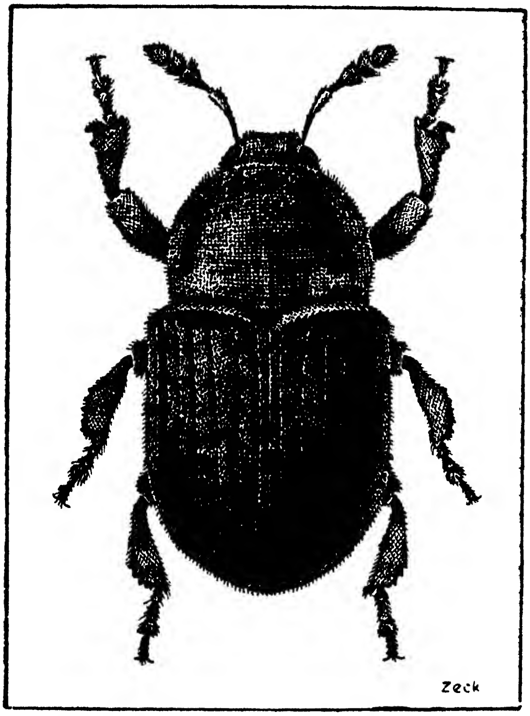
covers bear four small but distinct prominences towards their tips, and smaller ones near their bases, and there is also a pair on the front margin of the thorax. The antennae are slender and elbowed.

The Fig Twig-Borer.

(*Hylesinus fici*).

This borer belongs to a group of beetles which are known popularly as ambrosia beetles, bark beetles, shot-hole and pin-hole borers. In its native state it has been recorded developing in the Moreton Bay Fig (*Ficus macrophylla*), and the Port Jackson or Rusty Fig (*Ficus rubiginosa*) and in other native figs. At times it causes serious damage to cultivated figs.

The larva usually tunnels through the centres of the terminal shoots of the tree and feeds on the tissues within. It is a small, white, legless grub, which, when fully-fed enters its pupal stage within the tunnel.



The Fig Twig-borer.

The adult, which measures less than 1/6 inch in length, is a thickset, rounded beetle and is dark, reddish-brown in colour. The adults gnaw their way out through the sides of the twigs and their small circular exit-holes may be seen near the axils of the leaves. The adults are to be found on the twigs and leaves during the summer months, and they may cause damage by nibbling the bark.

The Auger Beetle

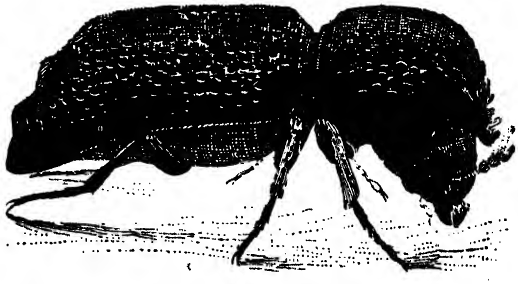
(*Bostrychopsis jesuita*).

These beetles have derived their popular name from their habit of boring circular holes. They attack many kinds of trees, including various species of gums and wattles, *Cassia* sp., silky oak (*Grevillea robusta*), white cedar (*Melia azedarach*), pepper trees (*Schinus molle*), tamarisk (*Tamarix* sp.) and kurrajong trees (*Brachychiton populneus*). In the orchard, apple, apricot, fig, lemon and orange trees may be attacked. The adults have also been recorded boring into lead covered aerial cables.

The female has been observed to lay its eggs just below the surface of the bark. Related species abroad lay their eggs in natural cracks and holes in the trees or in short tunnels made by the female in the wood. This auger beetle also has the habit of boring into the wood.

The larva is a thickset, white grub, with small legs, and the tunnels in which it has been feeding become tightly packed with frass and undigested residue of wood eaten by it. When fully-fed, the larva enters its pupal stage within a cell at the end of a tunnel, and the adult, when ready to emerge, bores a circular exit-hole through to the surface of the bark. The beetles commence to emerge during September.

The adult of this species, which is the largest known member of its family in Australia, is of variable size, measuring from ½ to ¾ inch in length. It is of a general glossy black, with reddish-brown antennae, and the head is turned down beneath the prothorax, the front portion of which is covered with spines.



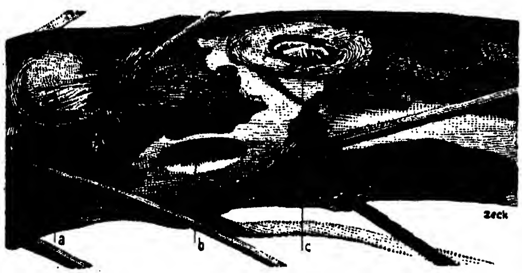
The Common Auger Beetle.

The Pine Weevil

(*Aesiotes leucurus*).

This weevil attacks various species of cypress pines (*Cupressus* and *Callitris* spp.), the common pine (*Pinus radiata*), and the Aleppo pine (*Pinus halepensis*). These pines are commonly used along drives or in homestead gardens, etc., for ornamental purposes, and as orchard breakwinds. At times, only a few trees in a row may be attacked, the first symptoms of injury being dying back and loss of colour.

The Adult.



Infested Pine Wood.

The female deposits its eggs upon or just under the surface of the bark. The larvae or grubs, which may measure up to ¾ inch in length, are white and legless. They feed between the bark and the sapwood, and when fully-fed eat out a shallow cavity in the sapwood, and form a regular, elongate-oval cocoon, composed of shreds of wood. In this they enter their pupal stage. The pupa, which is whitish, measures slightly less than ½ inch in length.

The adult weevil, which measures about 5/8 inch in length, is dull, and varies from almost black to chocolate-brown. It is mottled with fine, white scales, which form markings on the head and legs, while at the tip of the wingcovers there is a large white area. The prothorax forms a hood-like projection over the head, and there are two pairs of blunt spines towards the end of the wingcovers.

The weevils may be found, from about September, onwards to March, either amongst the foliage or resting on the trunks and limbs of the trees, where they are difficult to detect.

Cypress Pine Buprestid Beetles

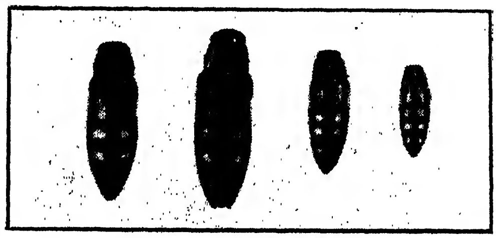
(*Diadoxus erythrurus and D. scalaris*).

Two species of buprestid or jewel beetles infest various kinds of cypress pines (*Callitris* and *Cupressus* spp.), and at times cause damage to these trees growing around homesteads, etc.

The beetles lay their eggs in the bark, and the grubs, on hatching, feed on the inner surface of the bark next to the sapwood. The infested portion may become filled with irregular, oval galleries or channels, which are firmly packed with wood-dust or frass.

The larvae are yellowish grubs of elongate form, with their thoracic segments flattened and wider than the rest. When fully-fed, these larvae, which may reach about 1 inch in length, cut narrow, oval burrows into the sapwood to a depth of about 1 inch, and in these chambers transform into pupae. Later the adults gnaw their way out through the bark.

The adult of the smaller species of beetle (*D. erythrurus*), which may measure up to about 5/8 inch in length, is brownish or black with greenish or yellow markings on the upper surface. Beneath it is green and reddish-brown or yellowish. The adults, which are active insects that fly readily, emerge from the trees from about November to the end of January.



Cypress Pine Buprestid Beetles.

A Buprestid Larva or Grub.

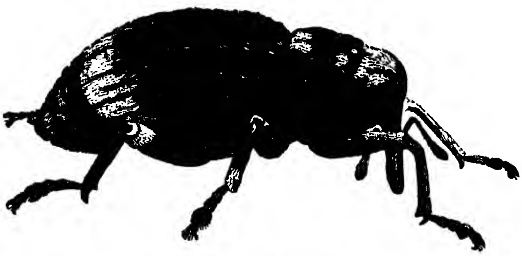
The larger related species is not as frequently observed causing damage to cultivated pines.

Occasionally, these jewel beetles have been found emerging through floor coverings in newly-erected dwellings, the larvae having continued their development after the pine timber used for the floors had been laid down. They do not, however, reinfest the timber.

The Kurrajong Weevil

(*Axionicus insignis*).

This weevil, which is often referred to as the "mimic bark weevil," on account of its protective colouration, remains half hidden in the cracks and crevices in the bark of the tree during the day.



The Kurrajong Weevil.

The eggs are laid in the branches and trunks of the Kurrajong trees, and the larvae, which may measure up to ½ inch in length when fully-fed, are stout, legless grubs, with white bodies, and small reddish heads. These larvae honeycomb the wood with circular tunnels, and when fully-fed enter their pupal stage in the end of one of these burrows. Later, the adults emerge, and the tree is riddled with large holes through which they have made their exit.

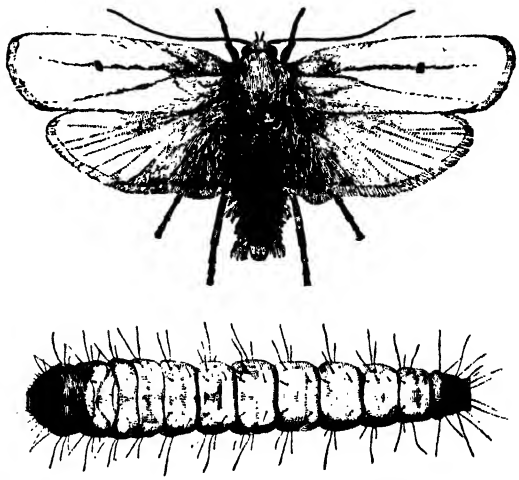
The adult, which may measure up to ½ inch in length, is mostly black, but is so closely covered with white and brownish scales that it appears to be grey, and is difficult to detect on the bark of the tree. The white scales form patches on the thorax and towards the tip of the wingcovers.

The adults may be found throughout the year on the trunks of the trees.

The Fruit-Tree Moth Borer

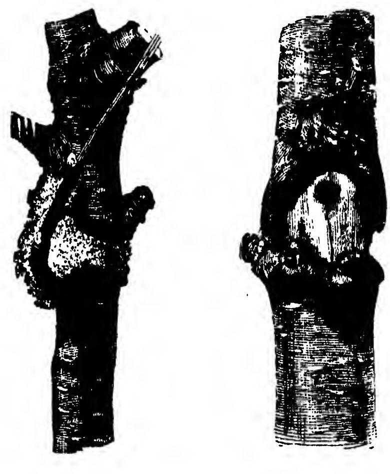
(*Maroga unipunctata*).

The caterpillars of this moth infest the trunks and branches of the Black Wattle (*Acacia decurrens*) and the common "Honeysuckle" (*Banksia serrata*). In the orchard, it is probably the most frequently noticed borer, on account of the mass of gnawed wood and excrement which the caterpillar webs together to cover the entrance to its tunnel. Cherries, peaches, nectarines, plums and prunes are attacked. Various shade and ornamental trees, including elms, planes and willows, may also be infested.



Adult and Caterpillar of Common Fruit-tree Moth Borer.

The eggs are deposited on the surface of the bark, and the small larvae or caterpillars, on hatching, commence to feed on the bark and bore downward into the tree.



Branch Showing Webbed Material Covering Tunnel Entrance, and Material Removed to Show Damage.

The tunnel is increased in size as the larva grows, until finally it is 3 to 4 inches in length by the time the larva is fully-fed.

The tunnels are usually made in the forks of the trees or between the main branches, but on small trees, with upright limbs, continued bark-feeding may lead to ringbarking of the trees.

During the day the caterpillar hides in the tunnel, and at night comes out to feed upon the bark surrounding the tunnel entrance. The damaged bark is always covered with a webbed mass of gnawed wood and excrement.

The caterpillar, which may measure up to 1½ inches in length, when fully-fed, is reddish-brown in colour, and, before changing into a pupa, closes the entrance to the tunnel with a wad of silken web and chewed wood.

The adult moths, which vary in size from about 1½ to 2½ inches across their outspread wings, are satiny-white. The upper surface of the abdomen is black, with an orange-coloured fringe of hairs, and a thick tuft at the tip. There is a small black spot near the centre of each of the forewings.

Control.

Most tree borers are extremely difficult to control, as usually their presence is not noticed until they have caused considerable injury, and by that time many of the larvae are deep within the wood.

As trees that are in a weakened or unhealthy condition are more susceptible to attack by borers, efforts should be made to increase their vigour by cultivation, and the use of suitable fertilisers. In some instances a severe pruning may also result in a marked improvement.

Fruit-tree Moth Borer.—Control of these caterpillars may be obtained by removing the mass of webbed material from the bark to expose the tunnel opening, and then inserting a piece of pliable wire, and twisting it around to kill the caterpillar.

Another method is to inject a few drops of kerosene into the tunnel to cause the caterpillar to crawl out, when it can be destroyed.

After treatment, the tunnel should be plugged with grafting wax, or other suitable substance, to prevent decay or the entry of secondary insects, which may add further to the damage. The exposed wood-surface should then be painted over.

Other Borers.—Heavily infested limbs, where practicable, should be cut off and burned. Dying or dead trees, and prunings, etc., should not be allowed to remain about, as larvae in these are usually able to develop through to their adult stage, and may migrate to surrounding trees to deposit their eggs.

In some instances, the infestations of borers which feed between the bark and the sapwood may be reduced by removing parts of the bark, and destroying the larvae beneath. Where this is done the exposed surfaces should be painted to prevent further decay.

Painting the trunks and limbs of the trees with bluestone paint, in the spring, is also beneficial, as the paint acts as a deterrent to the female beetles and reduces egg-laying. The formula for the bluestone paint is as follows:—

Copper sulphate	1½ lb.
Lime (quick lime)	1 lb.
Water	2 gallons.

(If hydrated lime is used the quantity should be increased to 1½ lb.)

To prepare this paint, the copper sulphate is dissolved in approximately half the amount of water; the lime is broken down with the remainder of the water, and is then poured into the bluestone solution, and mixed to form the paint. *Bluestone should always be dissolved in a wooden, earthenware or copper container. Iron and galvanised iron vessels should not be used.*

A tree-borer repellent which has been recommended in America for control of a buprestid beetle attacking apple trees is as follows:—

Soft soap	25 lb.
Water	1½ gal.
Flaked naphthalene	12½ lb.
Flour	1 lb.

To prepare this mixture the soap is first placed in the water for several days and allowed to soften. It is then placed in a double boiler and heated to a temperature of 180 deg. Fahr. The flour is then stirred in, the naphthalene added, and the mixture again brought up to 180 deg. Fahr., at which temperature the naphthalene will have melted. The mixture is then cooled as quickly as possible and stirred occasionally.

(*Continued on page* 390.)

BEEKEEPING HINTS.

THE WAX MOTH AND ITS CONTROL.

D. L. MORISON, B.V.Sc., Apiary Branch.

THE wax moth can cause serious loss to the careless or inexperienced beekeeper. In the days of box hives it was very destructive, and eventually its ravages forced beekeepers to house their bees in frame hives.

With the universal use of frame hives, control over wax moth has been greatly simplified, but adequate precautions against damage must be taken if losses are to be avoided.

In New South Wales, beekeepers are required by the Apiaries Act to clean up any wax moth-infested material in their possession.

Two species of moth are known by the name Wax Moth; they are (1) The Greater Wax Moth (*Galleria mellonella*); and (2) The Lesser Wax Moth (*Achroia grisella*). These two moths and their larval stages are known by a variety of common names—including wax moth, wax worm, web worm, etc.

Wax moth is referred to in very early literature on beekeeping written B.C. To-day it is widely distributed and occurs in practically every country where bees are kept. The late Mr. A. Gale, formerly Bee Expert of the New South Wales Department of Agriculture, records that it was introduced into Australia about 1872, and decimated the bee population which at that time was kept in box hives.

Life History.

The life history of the wax moth is roughly as follows *:—

The wax moth is an insect and undergoes the following stages in its life cycle: egg, larva, pupa, adult.

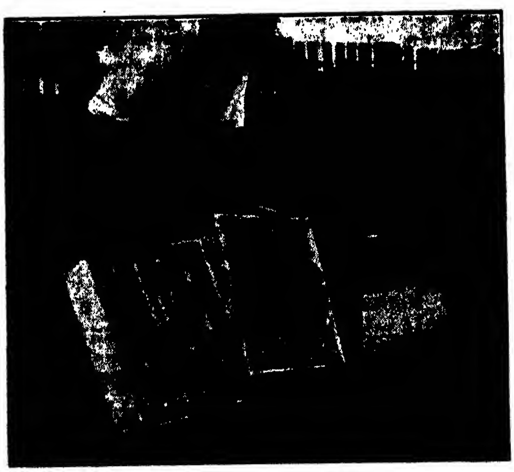
The Egg.—The egg of the wax moth is small (1/54 inch x 1/60 inch), white and rather inconspicuous. At 75 to 80 deg. Fahr. the eggs hatch in from 5 to 8 days, but with low temperatures (50 to 60 deg. Fahr.) this period may extend to 35 days.

Under apiary conditions the incubation period is almost entirely dependent on temperature. The eggs are mostly laid in the crevices between hive parts, and even on the comb in the darker parts of the hive.

* Summarised from Circular 386, U.S.A. Dept. Agric.

The Larva.—The young larvae, upon hatching, are most active, and on casual observation look more like small lice than the familiar wax worms. These young larvae burrow into the comb until they reach the midrib of the comb along which they tunnel.

The growth of the larvae depends upon several factors, of which the quantity and quality of the food, and the temperature are most important. The length of the larval period from the time of hatching of the egg to pupation has been found to range from 1 to 5 months, the optimum temperature for their development being about 85 to 95 deg. Fahr. At temperatures below 40 to 45 deg. Fahr. the larvae cease to feed and their growth is arrested.

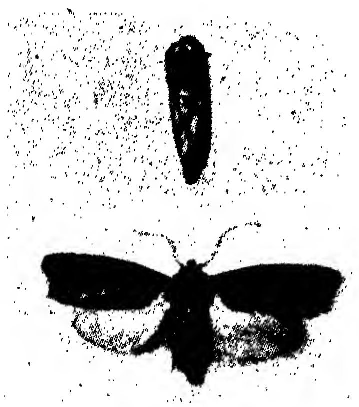


A Moth-ridden Neglected Hive.

The Pupa.—The duration of the pupal stages varies from 8 to 62 days, depending on temperature.

The Adult.—The adults of the larger wax moth, which is the commoner species, are about ¾ inch in length and have a wing-spread of 1 inch to 1¼ inches in well developed specimens.

The female commences to lay from 4 to 10 days after emergence and continues to lay for about a fortnight, during which period an average of nearly 300 eggs is laid.



Adults of the Female Wax Moth.
Above.—Wings folded.
Below.—Wings spread.
[*After Whitcomb.*

Influence of Temperature.—It will be seen that the most important variable affecting the time taken for the wax moth to complete its life cycle is temperature. This explains why the wax moth is more active in the summer, and in cold winters is inactive, since the larvae are inactive below 40 deg. Fahr.

The Damage Caused.

The adult wax moth does not appear to cause damage, but the larva is very destructive to comb. When comb is unprotected and conditions are favourable for the development of the larva it burrows into the comb, making tunnels lined with a silken web. If many larvae are present and conditions are favourable for their development, all the dark brood combs will be destroyed and replaced by thick matted webbing.

The larvae first tunnel to the midrib and destroy the bases of the cells; then the walls of the cells are destroyed, and finally tunnels are constructed between combs. In a frame hive where combs have been destroyed by wax moth the mass of webbing has to be torn before the frames can be lifted out.

Dark brood comb is preferred by wax moth larvae, and this type of comb is most favourable for their development, since the dark, larval cocoons left by the emerged bees contain protein which is essential if the wax moth larva is to grow into a vigorous adult.

Although the larvae can develop to a certain extent on foundation, the percentage mortality is high, maturity is delayed, and any adults which eventuate are very small.

The fully developed larva sometimes causes damage by hollowing out the timber of the hive for the purpose of affording additional protection to the pupal case when it is spun. If the combs in a neglected hive are destroyed by wax moth the frames are often seriously damaged as well, due to this tendency of the late-stage larvae to hollow out a cavity for the pupal case.

Control Measures.

Wax moth is extremely widespread and its eradication is, of course, a practical impossibility, but losses from moth damage can be avoided by the adoption of suitable control measures. Apiarists should not become careless and allow the moth to build up in old combs, etc., and should take precautions against infestation of combs when conditions are favourable for moth development.

The control of wax moth can be considered under two main headings, viz., control in the hived colony, and control in stored combs.

Control in the Hived Colony.

If the colony is numerically strong and can adequately care for the comb in the hive it occupies, comparatively little or no damage from wax moth will result. With black bees a trace-work of wax moth tunnels is sometimes to be seen on the cappings of the brood, even in strong colonies. However, with Italian bees, which are less tolerant of wax moth, this is not so often seen.

The wax moth caused great damage when bees were kept in box hives, because the quantity of comb in weakened colonies could

not be adjusted to suit colony strength. When colonies died out fumigation of combs was not carried out, as a rule, with the result that it merely required a bad season to result in the destruction of the majority of the combs in a box hive apiary.

However, since the advent of the frame hive the control of wax moth has been much simplified—for not only can better beekeeping methods be practised and measures taken to maintain colony strength, but the number of combs which the bees can adequately care for can be estimated, the surplus removed and kept moth-free as described later under the heading "Control in Stored Combs."

To assist in keeping down wax moth in the hived colony, the hive material should be of good quality and free from joints and cracks in which wax moth larvae may shelter.

The cleaning of the bottom board of the hive may be important, especially with weak colonies during the autumn. The rubbish which sometimes accumulates on the bottom board provides food and refuge for wax moth larvae, which may also invade the combs from the lower edge. It is possible for larvae of the lesser wax moth to grow to maturity in a surprisingly small amount of rubbish on the floor of the hive.

Eggs of the Wax Moth Laid on Comb.
Greatly Enlarged.
[*After Whitcomb.*

Control in Stored Combs.

Drawn combs are a very valuable asset to the beekeeper, especially if he desires to make rapid increase after experiencing a bad season. It is, therefore, extremely important that all good combs should be saved. Any combs which are not worth keeping should be culled out and rendered down for the wax that they contain.

Autumn is a convenient time at which to cull combs, and if all old comb which is not worth keeping is rendered down it cannot then act as a breeding ground for wax moth.

Unless proper precautions are taken, stored combs are certain to become infested with wax moth if the temperature is sufficiently high to allow of their action (above 40 deg. Fahr.).

There have been many instances of combs having been destroyed by wax moth owing to neglect or forgetfulness on the part of the beekeeper. During the summer neglect of stored combs for six weeks or so may result in their reduction to a mass of wax moth webbing.

Fumigation.

By far the most efficient method of controlling wax moth in stored combs is by fumigation.

None of the usual fumigants is 100 per. cent effective against the eggs of the wax moth, though effective against the larvae pupae and adults. Many beekeepers have lost combs as a result of placing them away in a moth-proof container when there was no sign of wax moth activity, because the combs have been destroyed by larvae which hatched out from eggs present.

The main fumigants used in wax moth control are as follows: Cyanogas, carbon bisulphide, paradichlorobenzene and sulphur dioxide.

Cyanogas.—This is a proprietary preparation consisting mainly of crude calcium cyanide. Since it is produced in America, the present dollar position renders its availability uncertain.

On exposure to moist air, the calcium cyanide hydrolyses and gives off hydrogen cyanide (or prussic acid gas). *This gas is extremely poisonous and care should therefore be exercised in its use.* The gas formed is lighter than air, and rises quickly as a result.

When using cyanogas for fumigation the boxes of combs are best stacked in tiers of five so that they fit closely. A Beuhne or other cover can be placed on top, and an ordinary brood chamber with entrance and bottom board can be used as the bottom box of the tier.

Each tier is fumigated by placing about 1 level dessertspoon of cyanogas (A dust) on a sheet of thin cardboard about 10 inches x 12 inches, spreading it fairly evenly over the cardboard with a short piece of lath, and pushing the cardboard into the entrance of the bottom box, which is then closed by either plugging it with hessian or using the entrance fastener which may be fitted for use when moving the hives.

If the cyanogas is spread out the gas is evolved very quickly and a high concentration of gas is quickly attained, killing any wax moth which may be present.

It is futile to gum up cracks etc., with paper or red lead in the hope that the gas will be held in permanently. HCN is a highly diffusible gas and it would be a practical impossibility to hold it in such places for long.

During summer when wax moth is prevalent it may be necessary to repeat the treatment every two to three weeks. In the winter when the temperature is below 40 deg. Fahr. there will be no wax moth activity. However, it is just as well to carry out inspections at regular intervals to make absolutely certain that no moths are present.

Fumigation with cyanogas should not be carried out adjacent to dwellings. If the weather is very dry it may be as well to sprinkle a little water on the combs in the first box. Care should be taken not to get any water into the tin of cyanogas.

If left exposed to the air cyanogas "spends" itself very quickly. Once "spent" it is no longer poisonous and if present on combs will not harm the bees.

Care should be exercised in the storage of cyanogas so that air is excluded from the container, and it is beyond the reach of irresponsible persons. If it is not intended to use the cyanogas for a period, it is best sealed down with a rim of grease around the edge of the lid, so that all air is excluded.

When opening a tin of cyanogas, do not hold your head above it as the gas present in the tin rises quickly and can cause a headache or worse. Have everything in readiness before using cyanogas and carry out the operation quickly since the gas is evolved very rapidly.

Poisoning with cyanogas is one of the best means of killing colonies of bees affected with American Foul Brood prior to burning, or otherwise disposing of them.

Carbon Bisulphide.—Commercial carbon bisulphide is a heavy, evil-smelling liquid which volatilizes at ordinary room temperature to form a heavier-than-air, poisonous, highly inflammable vapour. *Care should be taken when using it to see that there is no possibility of ignition from pipe, cigarettes, naked flames, heated metal, etc., especially near floor level, since otherwise a serious explosion may occur.*

Carbon bisulphide may be used in a manner similar to that described for cyanogas, i.e., using tiers of supers. However, when using this method place the CS_2 in a container inside the top of the tier since the gas is heavier than air and sinks down the tier. No openings should be left especially near the bottom of the tiers.

However, the best method of using carbon bisulphide is to place all the boxes of combs in a large galvanised iron tank of 2,000 gallons capacity, place a quart of CS_2 in the tank and seal down the opening in the top of the tank. This may be done by placing a cover in it, pasting layers of paper across cracks, and finally giving the paper a coat of paint or varnish. The success of this method largely depends on sealing the tank down so that there are no openings for escape of CS_2 vapour or entry of wax moth.

If the tank leaks, the combs may be destroyed without the beekeeper's knowledge —since he cannot inspect them.

Paradichlorobenzene (PDB).—This is a crystalline substance which slowly volatilizes on exposure to air. It is of use where only a small number of hives are kept and the apiarist has not much time to give to control of wax moth. It takes quite a while to disappear and this lingering repellent action renders constant supervision unnecessary. The crystals must be renewed when they volatilize.

Sulphur Dioxide.—Sulphur dioxide was formerly commonly used for the control of wax moth in comb and for the killing of bee colonies. It is seldom used now because of its highly irritant effect.

This procedure is not favoured owing to the possibility of abuse in the hands of a careless beekeeper.

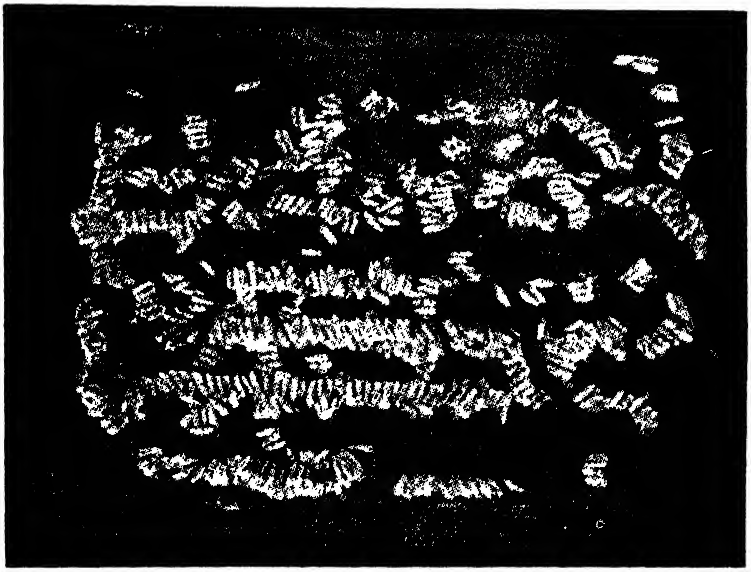
Drowning in water is a messy business and the combs have to be dried afterwards.

The spraying or dusting of DDT on combs to prevent wax moth infestation would be a disastrous procedure; bees placed with such comb, for quite a period after, would be killed.

The Legal Requirements.

It will be seen that wax moth is not as great a danger, nor is it as difficult to deal with as is American Foul Brood. However,

Pupal Cases or Cocoons of the Wax Moth.
After Whitcomb.



wax moth can cause serious loss to the inexperienced or careless beekeeper.

When using sulphur dioxide the treatment is usually carried out on a concrete floor. Two ounces of sulphur is placed in a tin containing a few live coals, an empty super placed over this (to prevent damage by fire to combs) and a tier of five boxes of combs plus cover placed over the super.

It is best to air the combs before placing them with colonies.

Other Control Measures.

Wax moths are repelled by light, and if combs are placed in a lighted situation little or no infestation occurs. However, combs stored in this way usually takes up a lot of space and if they are exposed to the weather in supers (as when they are stacked criss-cross) the material may deteriorate.

A New South Wales beekeeper is under a legal obligation (Section 4, Apiaries Act of N.S.W., 1944), to clean up any wax moth infested material in his possession, so that the danger of moth infestation in neighbours' apiaries will be reduced.

It has been stated that "wax moth is an asset to the careful beekeeper" because it destroys combs in bee trees where disease may lurk, and has a tendency to put the careless beekeeper out of business. There is no doubt, however, that wax moth is a greater liability than an asset, and adequate precautions must be taken against it if losses are to be avoided.

VITICULTURAL NOTES.

THE PLANTING OF GRAPE VINES.

Suitable Soils and Good Management are Essential to Success.

H. L. MANUEL, Principal Fruit Officer (Viticulture).

BEFORE land is planted with grape vines it should be thoroughly prepared by deep working. Soil that is not suitable for deep working should not be planted to vines.

Land can be gradually "deepened" by the growing of annual crops for some years before planting with vines, each ploughing given being deeper than the previous one. In time the lower layers of soil will improve and become more suitable to receive the young vines. This happens because surface soil contains more plant food than subsoil; it is advantageous to place some surface soil so that it will be in contact with vine roots, at least at the depth of planting.

Deep Ploughing and Subsoiling.

To make a satisfactory vineyard the soil should be of such nature that it can be deep-ploughed, in the preparation ploughing, to a depth of from 14 to 18 inches. If desired to improve the job still further, a subsoiler could follow the trenching and work the bottom layers below the 18 inches. It would not be amiss to give the trenched soil a dressing with lime if it is of a heavy type.

Shallow soils overlying heavy clay subsoil should not be deeply worked, and immediately planted; bringing to the surface large amounts of clay will result in making future cultivation almost impossible, since the clay will run together and set quickly after rain or watering. Such soils should really be avoided.

After deep preparation of a suitable area, the ground can be reploughed at a shallow depth and worked down level for marking out and planting. Harrows, followed by a flat surface roller, will make a good surface for marking out.

Marking Out.

Strict attention should be paid to marking and pegging out of the area; this will not only result in a vineyard of attractive appearance, but will also facilitate cultural operations. A badly marked out vineyard will be a permanent eyesore.

Planting wires should be used in the marking out. Ordinary No. 10 gauge wire is easy to handle; the distances between the vines can be marked on the wires with either daubs of solder or paint.

Handling the Young Vines.

When the young vines are received from the nursery, they should immediately be heeled in, being well covered with soil, and held in this manner until ready for planting out in their permanent vineyard positions.

Avoid planting with short vines. The rooted vines should not be less than 14 inches long, and for preference a few inches longer.

The top growth of the young vine should be reduced to a spur of two main buds, and all roots with the exception of the bottom ones removed by close cutting. The lower ones should be trimmed back to 3 inches before planting.

During the operations of planting, carry the young vines in a bucket containing some water—sufficient at least to cover the roots. This will prevent drying out.

When planting, ram the soil well around the roots and press down the soil when filling in the hole. A long-handled, round-mouthed shovel is a good tool to use for the digging of the holes. If the soil has not previously been deeply worked, the planting is made more difficult and the vineyard may be permanently affected since the young vines are

(Continued on page 390.)

CHEESE MITE CONTROL.

Use of Dichlorethyl Ether as a Fumigant.

G. J. SHANAHAN, B.Sc.Agr., Assistant Entomologist, and
A. B. SHELTON, Special Dairy Officer.

DESPITE the high quality of New South Wales cheese, mite damage is a problem of the processing and storage of this foodstuff to which insufficient attention is given.

A rapid and efficient method of controlling the pest by fumigation with dichlorethyl ether is now available.

Several methods of control have been tried in the past but have not been entirely satisfactory. The measures used were fumigation, mainly with sulphur, and routine cleansing.

Fumigation with sulphur has been largely discarded because of the corrosive action of the sulphur on metal surfaces of modern cheese room equipment. Routine cleansing, which means increased handling costs, is difficult in well-stocked cheese rooms as the amount of free shelving space is reduced to a minimum.

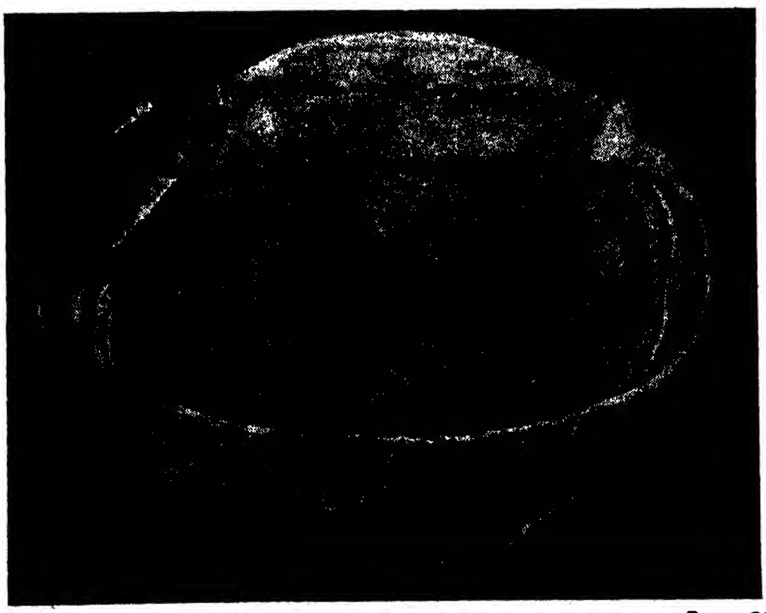
Muggeridge and Dolby (1943) first mentioned the toxicity of dichlorethyl ether to cheese mites, and later (1946) demonstrated the practical value of their discovery by showing that a satisfactory mite kill could be obtained in infested rooms when the toxicant was applied as either a vapour or liquid.

For the vapourisation method the requisite quantity of ether was heated over a hot plate and the resultant vapour dispersed throughout the room by a fan, the dosage rate being 8 oz. per 1,000 cubic feet of room space. The other procedure consisted of brushing or spraying the shelving with the chemical at the rate of 1 lb. of dichlorethyl ether per 1,000 cubic feet of room space.

More recently, Rice (1948) and Nicholls (1948) have outlined experiments in Queensland in which the dichlorethyl ether was sprayed into the cheese room as a fine mist from a duco type gun at the rate of 1 lb. per 1,000 cubic feet of room space.

For all methods of treatment a low survival rate was obtained with mites in

Infested Cheese Unwrapped to Show Mass of Mites.



exposed situations. Protected mines, *e.g.*, between cheeses, frequently escaped injury, as the fumigant has poor penetrative qualities. Hence it was seen that the cheese should be wedged up to allow the vapour maximum access to the mites. The value of turning the cheese and re-fumigating was also recognised.

Since dichlorethyl ether offered a practical solution to the cheese mite problem, a demonstration with the fumigant was conducted in a cheese room in Sydney in October, 1947. Before describing the work it is felt that brief reference to the species of mites which infest cheese in this State, their life history and the damage caused by them, may interest those who manufacture and store cheese. A comment on the salient features of dichlorethyl ether is also made.

Life History of Mites.

Several species of mites belonging to the family Tyroglyphidae, occur on cheese in this State. *Tyroglyphus farinae* and *Tyrophagus putrescentiae* are the most prevalent species, but *Glycyphagus domesticus* is not uncommon. The mites will also flourish on many types of foodstuffs, farinaceous material, straw, etc., besides cheese.

The life histories of the various species of mites are similar; they each pass through four stages—egg, larva, nymph (two forms) and adult. Under favourable conditions the period between egg and adult is less than three weeks, but it may take five weeks or longer at the relatively low temperatures which prevail in storage rooms.

The eggs are laid on the cheese and hatch into six-legged larvae in seven to twelve days. After feeding for about seven days the larvae form eight-legged nymphs. There are two successive nymphal forms. The last nymphal stage transforms into the adult mite, which can live for several months.

Tyroglyphid mites may also develop into an additional non-feeding nymphal stage known as the hypopus, with can withstand months of adverse environmental conditions. The hypopial form assists both the spread of the mite and maintenance of an infestation.

Damage to Cheese.

The effects of mites on cheese and the losses caused by them are too well known to the cheese industry to warrant a detailed account. By virtue of the enormous abundance of mites which feed in colonies on cheese serious damage can occur. In a typical attack the surface layers of the cheese are gradually eaten away. When the mass of mites, frass and cast skins are removed the cheese surface is honeycombed.

The extent of damage occasioned by the cheese mites depends upon the thoroughness of the control measures and the time for which the cheese has been stored. Where clean cheese is introduced into a mite-infested room, noticeable damage rarely occurs before six to twelve weeks, after which the characteristic condition produced by the mite becomes increasingly obvious.

Dichlorethyl Ether.

Dichlorethyl ether is a colourless, faintly oily liquid which gives off a persistent penetrating ether-like odour. It has a boiling point of 353 deg. Fahr. and a flash point of 185 deg. Fahr. One gallon of the liquid weighs 12.2 lb. and it costs approximately 2s. per lb. The vapour from the ether is violently irritating to the eyes and respiratory tract, and will cause anaesthesia of the operator, unless gas masks designed to withstand organic vapours are worn.

The vapour is extremely toxic to the common cheese mite (*Tyrophagus putrescentiae*) at a concentration of 0.046 lb. per 1,000 cubic feet of space and is 100 per cent. effective after 24 hours' exposure at 70 deg. Fahr. and 80 per cent. relative humidity.

Demonstration in Sydney.

Whilst several methods of applying the dichlorethyl ether for cheese mite control have been devised, the following procedure, based on Queensland experience, was proved to be both effective and simple in application by a demonstration in a cheese room in Sydney during October, 1947.

The storage room has a capacity of 16,000 cubic feet and is maintained at a temperature between 42 deg. to 45 deg. Fahr. with a relative humidity of about 80 per cent. It is provided with an internal circulatory system. In addition to the door, the room has a loading port, in the wall opposite to the door. Prior to treatment the circulatory system was shut off and the temperature of the room allowed to rise to 52 deg. Fahr. The room contained lightly- to heavily-infested cheese, mainly cheddar, waxed and unwaxed in loaf, medium and export sizes.

Dichlorethyl ether was sprayed into the room with a duco-type gun attached by hosing to a small electrically-driven compressor unit which gave a fluctuating air pressure of 25 to 40 lb. per square inch. The duco gun was provided with an adjustable nozzle which was set to deliver a fine misty spray. It took about one hour to complete the spraying.

The spray was directed between the tiers of shelves, towards the ceiling and into the corners of the room so that an even distribution of the chemical resulted. An attempt was made not to spray directly on to the cheese. The dosage rate was 1 lb. of liquid per 1,000 cubic feet of room space, this rate being more than twice the amount required to saturate the air within the room. The room was aired 64 hours after treatment.

Owing to labour difficulties it was not possible to arrange the cheese, by wedging it apart or any other means, to give the fumigant access to the mites which occurred in protected sites. For similar reasons the cheese was not turned after airing and the room fumigated again.

The treatment was extremely effective against mites freely exposed to the fumigant, but a high survival rate was noticed amongst mites when the fumigant failed to reach them. These results were in accordance with the findings of the New Zealand and Queensland experiments.

The mite population gradually increased and it would have been advisable to refumigate 2½ months following the initial fumigation.

Nicholls (1948) states that two or three applications per annum of dichlorethyl ether may be necessary. Actually the intervals between treatment would be governed by the thoroughness of the fumigation, the temperature of the room, re-infestation by addition of infested cheese and the period for which the cheese is held.

For the demonstration the dichlorethyl ether was applied with a duco-type gun for which compressed air is necessary; however, a satisfactory control of the mites could be obtained by use of a knapsack spray or similar equipment fitted with a very fine nozzle, 0.03 inch diameter, to give a misty spray.

Effect on Flavour of the Cheese.

Although the smell of dichlorethyl ether was distinctly noticeable in the treated storage room several weeks following treatment, the quality of the cheese was not impaired. A slight ether-like odour could be detected in the rind for some days, but no taint was present in the body in the cheese.

Even though tainting does not appear to be a problem, it is suggested that the fumigant should not be sprayed directly on to the cheese.

Precautions.

As dichlorethyl ether vapour is toxic to humans, gas masks which are proof against organic vapours should be worn by the operators.

Although the chemical is a highly inflammable liquid, the risk of explosion from its use as a vapour is remote. However, normal precautions should be taken to reduce the risk of explosion and electrical equipment should comply with the relevant rules of the Standards Association of Australia.

Since dichlorethyl ether forms a heavy vapour, the fumigant should not be used in cheese storage rooms unless the gas will either flow from the room when the doors are opened or can be mechanically removed.

Summary.

Dichlorethyl ether gave a satisfactory control of cheese mites in a storage room in Sydney.

The flavour of the cheese was not affected by the chemical.

Suitable gas masks must be worn by the operators exposed to dangerous atmospheres.

Normal precautions should be taken to minimise the risk of explosion.

References.

MUGGERIDGE, J., and DOLBY, R.M. (1943). *N.Z. J. Sci. and Tech.* 25 (B.), 223-225.

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NICHOLLS (1948). Butter Fats and Solids, Vol. 7 (1), 47.

RICE, E. B. (1948). *Agr. Gaz., Qld.* 66 (2), 108-109.

Laying Houses at Wagga Experiment Farm.

Poultry Notes.

E. HADLINGTON, Principal Livestock Officer (Poultry).

EGG PRODUCTION COSTS, 1947-48.

AT the end of the financial year it is opportune once again to review the cost of producing eggs during the season. This has been done and, as in previous years, a one-man farm has been taken as a basis for the estimate, as it would be extremely difficult to assess the cost on a larger unit basis, owing to the wider variation in conditions. However, there are numerous farms within the one-man category—of approximately 1,000 layers—and the figures will be of great interest to these poultry farmers.

In the figures quoted below, the same basis has been adopted as in previous years, necessary alterations having been made in costs of feeding the birds and purchase of chickens.

It will be noted that no amount is shown for the cost of rearing the season's chickens to productive age; it is considered that under present conditions this item would be adequately covered by the sale of hens.

The average gross price paid for all grades of eggs consigned to the Egg Board floor was approximately 1s. 11¾d. per dozen; thus the figures show a loss of about 3¾d. per dozen.

The comparative cost per dozen last year was 2s. 2.77d., which means that during the year there was an increase in costs of

ESTIMATED COSTS FOR YEAR 1947-48.

	£	s.	d.
Interest on land (5 acres at £60 per acre), at 5 per cent.	15	0	0
Interest on buildings and plant (£800), at 5 per cent.	40	0	0
Depreciation on buildings and plant (£800), at 3 per cent.	24	0	0
Maintenance costs	25	0	0
Cost of feeding 1,000 layers at 11s. 9d.	587	10	0
Purchase of 750 pullet chicks at £7 10s. per 100	56	5	0
Municipal or shire rates, water rates and excess water	25	0	0
Incidental expenses, vaccination, etc.	15	0	0
Labour allowance	413	0	0
Marketing costs (freight or cartage, control fund, deductions, handling charges)	181	5	0
Cost of producing 12,000 doz. eggs	£1,382	0	0
Cost per doz.		2s.	3.64d.

approximately 1d. per dozen. There was also an increase in the average gross price paid to producers of approximately 3½d. per dozen, the figures being 1s. 8¼d. last year compared with approximately 1s. 11¾d. for the year just ended.

Summing up the position disclosed by these figures it is seen that instead of the farmer receiving £413 for labour, as shown in the estimate, he has earned only about £225 net, compared with £100 10s. last year. However, those who sell portion of their eggs under a Producer Agency Permit would have received a somewhat higher average price than that paid to consignors to the Egg Board floors. Likewise those who secured a higher average production from their flocks than the twelve dozen eggs per hen per annum allowed in the estimate, would have shown a better return.

Although feeding costs show an increase of 9d. per hen since last year, this only includes the higher costs since January last. Thus, if there is no alteration in present prices of foodstuffs, there will be a still higher cost of, probably, 6d. per bird next year. On the other hand the influence of the higher export price for eggs has not yet been felt; it should more than counterbalance the extra cost of feed.

It must, of course, be realised that the actual income would be higher than £225, as the items shown for interest and depreciation (amounting to £79) would be income, except in the case of farmers paying interest on a mortgage. The poultry farmer is, however, entitled to interest on his investment since he must establish a sinking fund for depreciation in order to be able to renew the farm when worn out.

CARE OF CHICKENS.

IT cannot be over-emphasised that the successful rearing of chickens is a most important factor in ensuring a profitable flock of layers, and every effort should be made to avoid mistakes which lead to heavy mortality or the raising of unthrifty chickens.

The following instructions for handling chickens, which have been prepared by the Hatcheryman's Association in collaboration with the Department, should be of assistance to producers generally, but particularly to newcomers into the industry.

Rear your Baby Chicks Carefully.

BE PREPARED.

Your brooder room. . . Well lighted and plenty of fresh air but NO draughts please!

Bear in mind that any type of brooder is only as good as the house that contains it. Fresh air is necessary for healthy chicks, but provide it in such a way as to avoid draughts. A small lighted candle or match at floor level will detect floor draughts near your brooder.

Brooders which require to be bagged over, or shut in completely, to maintain sufficient heat, ARE UNSUITABLE.

Everything "chickshape" . . . Your brooder and brooder house should, of course, have been cleaned and disinfected as soon as the chicks were removed last year. In this way the majority of disease germs will have been eradicated, and after six months idleness very few will remain. A good clean-up of equipment and room before starting this season will complete the job.

Set up your complete brooder unit at least two or three days before the chicks are due, turn on the heat and allow to run at normal temperature. In every type of brooder this trial run has its advantages. It promotes perfectly dry conditions, and allows you to check regulators and burners under working conditions.

At this stage a thermometer should be used to test the ability of the brooder to maintain sufficient heat. This should be at least 90 deg. Fahr. (at floor level) when the brooder is empty, and during the coldest period of the day.

Have your mash mixed, your hoppers filled and your water fountains ready before arrival time.

Where litter is used, make sure it is dry and remains that way.

GIVE THEM A WARM RECEPTION.

Heat is very important—make sure that your brooder, whatever its type, is *warm enough to keep your chicks lively during the day, and well spread out during the night.* Chicks which are not lively do not venture out to explore their new world—to eat and drink. If they don't find food and water during the first day, their chances of survival are lessened.

Disease finds its mark much more easily with underheated or chilled chicks. KEEP UP THAT HEAT.

Don't be misled by a few hardy chicks who venture out under conditions of a "just warm enough" brooder. Even humans have their hardy souls who delight in surfing at Bondi on a cold wintry morning. They call these chaps "icebergs." *Make sure all your chicks as well as the "icebergs" are up and about,* and not huddled together for warmth.

A little extra heat during the day encourages chicks to leave the hover to find feed and water. *It is bad practice and very poor economy to turn off the heat during the day.*

RAIL AND AIR CHICKS—

Rail and air chicks should be treated as follows:—

(*a*) If conditions permit, examine chicks at the station.

(*b*) Report to Officer-in-Charge, at once, if chicks appear to have been mishandled or are sweated.

(*c*) If chicks are damp or appear cold or "huddled," place in brooder and confine closely until they spread out and become lively.

(*d*) *As soon as possible after arrival,* feed and water chicks, unless—

(i) They arrive at night, in which case the next morning will do;

(ii) You have received instructions to the contrary from your hatcheryman.

Under modern methods of hatching chicks generally arrive ready for feed and water.

While boxed chicks are under your control—

DO NOT—

(*a*) Stack more than two high.

(*b*) Expose in sunlight or draughts.

(*c*) Keep in heated rooms or near fires. (A room just comfortable for you will be about right.)

FEED AND WATER.

Fresh, clean water must be available *at all times.*

The brooder house should be well lighted.

Fountains must be placed at floor level, accessible, and be in a well-lighted position.

Water for baby chicks is usually supplied by inverted fountains, the best of these being the 2-lb. fruit tin and deep saucer. Punch a small hole about ½ inch from open end, fill with water and invert. A white saucer and tin are particularly suitable if the light is not perfect. A few small fountains are always better than one large one.

Combinations of feeds which can be used to produce a good chick mash are endless, but if you are not certain of yours, use one of the rations in the accompanying table.

Make sure your ingredients are *fresh,* and mix thoroughly particularly the salt, meat and milk.

The Day-old Chick.

Feed should be placed in shallow open trays for the first day, so that it can readily be found by the chicks. It should be the feed that chicks will be fed on for their brooder life. Kibbled grains should be fed as an evening ration, except when using an all-mash ration, but only as a supplement to the mash feed.

While sunshine supplies vitamin D to your chicks, dull cloudy weather may prevent sufficient absorption of this very necessary vitamin.

It is considered much safer to include a vitamin D oil in every chick ration. (Use according to directions.)

Battery chicks or any chicks not having direct access to sunlight MUST be fed a vitamin D oil.

MASHES FOR CHICKENS UP TO SIX WEEKS OF AGE.*

	Mashes to be used in conjunction with a grain chicken mixture for an afternoon feed; they can be fed wet or dry.			"All Mash" ration, without a grain mixture.		
	lb.	lb.	lb.	lb.	lb.	lb.
Pollard	36	45	37	15	25	20
Bran	18	10	11	10	10	12
Wheatmeal or other ground grains	15	10	20	44	27½	35½
Meatmeal (50 per cent. crude protein)	12	8	14	14	10	6
Buttermilk powder or skim milk powder	...	5	7	5	5	...
Whey powder	6	...	...	...	...	5
Peanut meal	5	...	...	...	...	5
Linseed meal	...	6	...	5	7	5
Cocoanut meal	...	...	5	...	5	...
Lucerne meal	5	10	5	5	10	6
Livermeal	...	5	...	...	...	5
Ground limestone (or twice as much bone meal) ...	2	...	...	1½	...	..
Salt	1	1	1	½	½	½
Total	100	100	100	100	100	100

*If used for chickens in battery brooders, these mashes should include vitamin D oil, and where no green feed is available vitamin A oil should be added.

After six weeks of age chickens can be fed on an adult ration.

TRAINING.

Chicks have a wonderful homing instinct but cannot use it if they do not know where home is.

Place a circle of hessian-covered wire netting (about 12 inches high) around your brooder. Do not allow chicks more than a foot away from the brooder for the first day, and gradually widen the circle every day for several days. Even grown chicks from a battery or other brooder need this initial training.

Once trained, chicks will move instinctively toward the warmth of brooders, day or night.

In the case of floor brooders, it is desirable to have a board platform as an insulation against dampness. Any small obstruction will prevent the free movement of chicks at night, so make sure that the platform extends beyond the hover limits for at least a foot or more.

OVERCROWDING.

Overcrowding of day-old chicks is a certain way of causing trouble.

As a rough guide, it may be taken that most manufactured brooders will only accommodate about two-thirds of their stated capacities for the full brooding period. Provide an inside run space of at least ½ sq. ft. per chicken.

DAMPNESS.

Dampness is the enemy of healthy chicks—germs become more active and remain virile over longer periods in damp conditions. The opposite condition of warmth and absolute dryness wards off disease—disease germs die off quickly under dry conditions and do not carry over or continue their life cycle. A dry shed is better than bottles of medicine.

STALE GROUND.

Ideally, each batch of chicks should go on to new ground and be allowed to build up resistance to intensive and artificial conditions. Baby chicks have no inherent resistance to the germs they will encounter. By placing them on ground which is new or, at least, rested for some months, they very gradually acclimatize themselves to their artificial environment.

It has been proved conclusively that chicks of the first batch do the best; why not try, as far as you are able, to provide "first batch conditions" for all of your chicks. A very thorough scraping and cleaning of brooder yards is a "must" after each batch of chicks.

ALL fowls and turkeys entering South Australia must now be accompanied by a health certificate signed by a government veterinary officer or inspector of stock, stating that the birds described have been examined and found at time of examination free of infectious laryngotracheitis (avian), and that to the best of his belief none of the said stock have been in any premises or place where the said disease has occurred during a past period of twelve months.

Proclamation to this effect has been issued in South Australia in order to reduce the danger of introducing infectious laryngo-tracheitis from other States where it is known to occur.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. O., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp. Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)	30
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188
Hawkesbury Agricultural College, Richmond (Jerseys)	106
Hicks Bros., "Meryla," Culcairn (A.I.S.)	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
McEachern, H., "Nundi," Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)	49
New England University College, Armidale (Jerseys)	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	35
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco (Jerseys)	89
Robertson, D. M., "Turanville," Scone (Polled Beef Shorthorns)	114
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112
Simpson, F. S., "Gunnewarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170
Von Nida, F. E., Wildes Meadow	30
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas, R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R., "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	42
Forster, T. L., and Sons, "Abington," Armidale	62
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young.	56
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Parramatta Mental Hospital	40
Peat & Milson Islands Mental Hospital	72
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	69
Salway, A. E., Cobargo (Stud Jerseys)	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

"Methoxone" Hormone Weedkiller

HORMONE WEEDKILLING . . .

"Methoxone" is harmless to grasses and cereals but effective against a wide range of noxious weeds.

"Methoxone" is non-poisonous, non-inflammable and non-corrosive.

"Methoxone" is available for control of WEEDS in CROPS, PASTURES and TURFS.

Here are a few of the troublesome weeds destroyed by "Methoxone"—Bathurst and Noogoora burrs, Hoary cress, Nut grass, Bindweed, Water hyacinth, Horehound, Staggerweed, Stinkwort, various Thistles and the common flat weeds of turf.

FIRST STAGE

The weed absorbs "Methoxone" which causes a serious physiological disturbance owing to the high concentration of the hormone in the plant.

SECOND STAGE

The stems thicken and leaves become twisted and contorted.

THIRD STAGE

The foliage changes colour and the weed dies. Meanwhile, cereal crops also sprayed are completely unharmed.

IM-1-24

"METHOXONE"

SELECTIVE WEED KILLER

N.S.W. Distributors:
WILLIAM COOPER & NEPHEWS (AUST.) PTY. LTD.

IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA AND NEW ZEALAND LIMITED

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.) ...	120	13/11/48
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	33	23/6/48
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ..	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	49	17/12/48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm	55	9/6/48
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	74	2/2/49
Limond Bros., Morisset (Ayrshires)	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys) ...	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys)	94	27/10/48
Riverina Welfare Farm, Yanco (Jerseys) ...	91	14/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)...	119	20/4/48
Yanco Agricultural High School, Yanco (Jerseys)	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle ...	51	20/4/49
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus ...	209	12/8/48
Burns, R. "Wilga Glen," Coonamble ...	20	24/12/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. C, "Heatherbrae," Swanbrook Rd., Inverell	32	11/8/48
Coventry Home, Armidale	11	29/9/48
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell ...	34	5/4/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	33	9/4/49
Forster, T.L., and Sons, "Abington," Armidale	67	27/4/50
Frizelle, W. J., Rosenstein Dairy, Inverell ...	111	9/9/48
Genge G. L., Euston, Armidale	36	22/9/48
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood ...	22	20/5/48
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	34	22/9/48
Ince, W. G., Kirkwood St., Armidale ...	11	12/4/49
Johnson, A., "Rosedale," Grafton Road Armidale	34	22/9/48
Kenmore Mental Hospital	77	7/7/48
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Gladesville Mental Hospital	7	12/12/48
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	40	20/11/48
McMillan, N., Duval Road, Armidale ...	30	29/9/48
MacNamara, B., "Mount View," Cessnock...	67	21/5/49
Marist Bros. College, Campbelltown ...	82	23/1/49
Mason, A., Killarney, Armidale	33	30/9/48
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Mullen, A. G., Goonoo Goonoo, Via Tamworth	57	6/3/49
Mullholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville ...	45	5/2/49
O'Brien, O., "Mount View," Inverell ...	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	12	29/12/48
St. John's Hostel, Armidale	6	24/6/49
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills ...	43	5/6/48
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boy's Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	54	5/4/49
S.C.E.G.S., Moss Vale	34	8/4/49
Tanner, F. S., Duval Rd., Armidale	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale ...	33	30/9/48

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
Tomba, P. C., Kellys Plains, Armidale ...	49	29/9/48
Tomba, R., Harlwood, Armidale	40	22/9/48
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48
Von Frankenberg, F. E., "Spring Hills," Camden	68	12/12/48
Waters, A., Marsh Street, Armidale... ...	2	13/10/48
Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	52	10/6/48
Williams, L. B., "Birida," Armidale ...	39	12/4/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unles subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Insect Pests—*continued from page 374.*

For use, the mixture is warmed sufficiently to produce a consistency of heavy cream, and is then applied with a brush to the trunks and main limbs of the trees. It may be stored in airtight containers.

Carbon bisulphide may sometimes be used for those borers in which the tunnels are not closely packed with frass, etc. A small quantity of this chemical is injected into the borer holes, after which the openings are plugged with grafting wax or some other suitable substance. The carbon bisulphide gives off a gas which may penetrate through the tunnels and kill some of the borers.

The gas given off by this chemical is highly inflammable and explosive, and all naked lights and fires, etc., must be kept well away from it.

Viticultural Notes—*continued from page 380.*

more or less potholed and there is a tendency for the roots to surface.

Cultivation Must Be Thoroughly Done.

Fertilisers need not be applied until later. When they are used it is advisable to apply them deeply. Although surface dressings may encourage weed growth (which may be beneficial), they attract the vine roots to the surface area in which they are cut by implements. In addition the vines suffer greatly when dry conditions prevail.

Only by thorough working of the vineyards can best results be obtained. Shallow cultivation and neglect of hand labour bring about poor yields. Modern implements cannot, and must not be expected to do all the cultivation work of a vineyard; a certain amount of hand work must be undertaken.

THE PROBLEMS OF SUCCESSFUL FARMING REVIEWED

By Agricultural Bureau State Conference

AT HAWKESBURY AGRICULTURAL COLLEGE.

THE theme chosen for the 25th Annual State Conference of the Agricultural Bureau of New South Wales, "Successful Farming is Skilled, Interesting and Dignified—It is Selective!" was well-sustained throughout the programme which was spread over the three days, 20th to 22nd July, during which delegates were in residence at Hawkesbury Agricultural College, Richmond.

Officially opening the Conference, His Excellency, the Governor, Lt.-General J. Northcott, emphasised the challenge given by the Conference to the enthusiastic farmer delegates to inspire their fellow producers to utilise the teachings of research. Mr. C. V. Janes, in a spirited address on the first day proclaimed the dignity, interest and profit to be found in a rural way of life, and the items which followed throughout the subsequent days stressed the many kinds of skill required to succeed in the primary industries.

The conference was attended by some two hundred and fifty delegates from Agricultural Bureau branches and units throughout the State. Many more desired to attend but accommodation was not available.

This annual conference is unique in that all the delegates live for three days at the College—sleep in the quarters of the students who are on vacation, eat together in the College dining hall and spend the times between sessions in unofficial inspections and discussions of the College farm and livestock or in friendly discourse in front of the fire in the "tuck shop". As a result, a very suitable background is provided for the technical items on the programme, and in addition, many new friendships are made and old ones renewed—and this is in keeping with the aims of the organisation.

Many distinguished visitors—representatives of other rural organisations, institutions interested in rural affairs and Government officials—attended the opening session.

Among those, in addition to His Excellency the Governor, who were welcomed by the General President, Mr. S. T. Parish, were the Hon. E. H. Graham, M.L.A.,

The Official Party at the Agricultural Bureau State Conference.

In the centre are Dr. R. J. Noble, Under Secretary; Mr. S. T. Parish, General President; Hon. E. H. Graham, M.L.A., Minister for Agriculture; His Excellency the Governor; and Mr. E. A. Southee, College Principal.

Minister for Agriculture; Mr. F. C. Richards and Mrs. Frances representing the South Australian Agricultural Bureau; Professor McMillan, Sydney University Faculty of Agriculture; Mr. C. R. McKerihan, President of the Rural Bank of New South Wales; Dr. R. J. Noble, Under Secretary and Director of the Department of Agriculture; Mr. R. C. Gibson, representing the Primary Producers' Union; Mr. Roberton, representing the Farmers and Settlers' Association; Mr. L. V. Toyne, Agricultural Attache, U.S.A. Consulate; and Mrs. Swanson of the Country Womens' Association.

The Official Opening.

Declaring the conference officially open His Excellency said that he was very glad to meet men and women from all over the

Members of the State Advisory Council of the Agricultural Bureau are presented to the Governor by Mr. S. T. Parish, General President.

State who were the enthusiasts of the primary industries—those who were interested in the scientific side of their activities and the work of the Department of Agriculture.

The State of New South Wales was fortunate, said His Excellency, in that it had a Minister for Agriculture whose "roots are in the soil," and in its Department of Agriculture. He had recently visited the Head Office of the Department to see the work being conducted, and he had also visited a number of Experiment Farms.

It was to be hoped that the delegates would acquire much useful information during the course of the conference. It would be their job to pass on the benefits to those in their home districts who were perhaps not so enthusiastic.

There was a great task ahead of the primary producer. Anyone who had travelled the length and breadth of the land, as he had, said His Excellency, must realise that we had, in the 100 to 150 years of occupation, only "scratched the surface." Not all the scratching had been good—many areas of forest had been needlessly destroyed and soil erosion had become a problem. He had recently travelled through the west and had seen grasses growing in areas in which they had not previously appeared for many years. "Not many were doing anything to conserve it as fodder" said the General. He had seen the difference in country when an enthusiastic farmer had improved the pastures and he had seen the improved types of cattle exhibited by such men at shows. There were great opportunities in this country if we conserved our resources.

Every landowner had a great responsibility to those who would come after. "What will be handed on to future generations depends on how we treat our farm lands now," said His Excellency.

The whole world was crying out for the foodstuffs our farmers produced. The United Nations Organisation had recently stated that there was 30 million children starving in Europe and 200 million people in the world short of food.

Farmers had a great responsibility in this matter and delegates to the conference in particular had a responsibility to pass on their enthusiasm to those who were not as keen as Agricultural Bureau members to learn the most efficient methods.

His Excellency congratulated the conference on the wide scope of the activities on the programme and expressed his pleasure in declaring the proceedings officially open.

Moving a vote of thanks to His Excellency for opening the conference, Hon. E. H. Graham, M.L.A., Minister for Agriculture, said that seldom had the State had a Governor with such an interest in primary industries. The Governor had given delegates some very sound advice. At the present time all sections of the community had a duty to produce to the utmost. Primary

One of the Many Outdoor Sessions which are Features of State Conferences.

Mr. H. Graham Smith, Apiarist at the College explains winter conditions in a hive.

producers had set an outstanding example to other sections.

Mr. Graham said he hoped that next year additional accommodation would be available for delegates. He was pursuing a programme of development at Hawkesbury Agricultural College and the Department's Experiment Farms which would make them of greater value to the rural industries.

1948-49 General President.

DURING the Conference, Mr. J. R. Somers, of Nelungaloo, was elected General President of the Agricultural Bureau for the year 1948-49.

He succeeds Mr. S. T. Parish, of Wallalong, who has occupied the position for the past three years.

The President's Annual Report.

In his annual report the General President, Mr. S. T. Parish, said that the attendance of so many delegates, visitors and officials at the conference augured well for the future of the movement. It had been impossible to accept many who desired to attend.

Prominent among divisional activities had been the attendance of 100 farmers at a field day at Mudgee, 250 men and women at a field day at Foxground, 400 men and women at a farm mechanisation and orchard day at Arcadia, and some hundreds of farmers and junior farmers at a pasture and dairying field day at Raleigh. The number of local branches had increased by eighteen during the year, and district or sub-district councils had increased by three. Special mention was made of the development in the Clarence Division where there had been an increase to ten branches, while Nambucca River District Council, Bellinger River District Council and Dorrigo Sub-district Council had been formed.

Youth Leadership Schools had been promoted by the Bureau at Hawkesbury College (60 young men and women in attendance), Lennox Head (30 young men and women in attendance), Newport—two (40 young men at one, 28 young women at the other). The Newport School for young women was attended by interstate representatives—from Queensland and South Australia—interested in promoting similar activities for their own farm youths. These courses of instruction in Chairmanship, Secretaryship, Public Speaking, Discussion Procedure, Play-reading, Debating, Constitutionalism, and so on, developed latent leadership qualities in young rural people who thereby proceeded better armed to accept citizenship responsibilities.

Among its activities the State Advisory Council of the Agricultural Bureau had made a donation of £40 to Hawkesbury Agricultural College in lieu of the Bureau

Scholarship for 1947 and had renewed the Scholarship in 1948, the holder being Mr. A. L. Cannings of Tregeagle, Lismore.

Items on the Programme.

The programme for the Conference was wide in scope and varied in form of presentation, making it both educational and entertaining. It comprised indoor sessions devoted to addresses, discussions, debates and demonstrations, and outdoor sessions featuring crop and stock demonstrations, livestock judging contests, etc. At times separate sessions were devoted to particular interests—e.g., women's sessions and industry sessions—and on occasions the delegates assembled in general sessions. Film projectors were freely used to illustrate many of the talks as well as to provide evening entertainment.

A feature of the programme was the Farrer Session at which Professor Prescott was presented with the Farrer Medal, and delivered the 1948 Farrer Oration, the subject being "Our Advancing Knowledge of Soil Fertility."

The lighter sides of the Conference programme included plays presented by the Kuring-gai Theatre Guild and a social evening and dance.

Among the well-known public men to address the Conference were Mr. C. V. Janes, Economist, whose subject was "The Role and Responsibilities of the Farmer"; Mr. L. V. Toyne, Agricultural Attache, U.S.A. Consulate, who spoke on "The Inevitable Drift"; and Mr. Gordon Munro, President of the Aberdeen Angus Breeders' Society—"Beef Cattle Husbandry from Breeder to Feeder to Hook." The subject of a debate which in itself was a lesson in debating technique was "That Primary Industries in Australia Should be Subsidised"; and a panel discussion was staged on the subject "Cereal Grain Industries in Relation to Livestock."

Women's Interests.

A programme of great variety was arranged for the special women's sessions. These included talks and demonstrations by Miss Jean Stephens, Dietician of the Department of Public Health on "Colour on the Meal Table"; by Miss Nancy Foskett, Extension Officer of the Department of Agriculture and Mr. G. T. Betts on "When the Homemaker Goes Shopping"; by Mrs. Oppen of the Society of Arts and Crafts on "Colour and Design in Your Home and Work"; by Mrs. W. E. Schowe of the Australian Missionary College, Cooranbong, on "The Humble Potato."

Other talks included those by Miss Lorna Byrne, Senior Extension Officer of the Department of Agriculture, on "Home Hobbies"; by Miss Beryl Hearndon of the Associated Country Women of the World and Mrs. E. A. Coghlan of the Country Womens' Association and the aims and Achievements of the A.C.W.W."; by Miss N. Fish of the Occupational Therapy Training Centre on "Occupations for the Family"; by Dr. I. Sibire of the Child Guidance Clinic on "The Growing Boy and Girl" and by Mrs. C. McNamara of the New South Wales New Education Fellowship on "Parents' Part in Education."

Short Refresher Courses for Ex-Servicemen at Yanco Experiment Farm.

THE following Short Refresher Courses for Ex-servicemen at Yanco Experiment Farm have been arranged to date:—

Number 7 Course.—11th October to 3rd December, 1948.

No. 8 Course.—10th January, 1949, to 4th March, 1949.

Ex-servicemen who have been discharged for less than one year who desire to attend a course may apply to:—

The Deputy Director Re-Establishment, Ministry of Post-War Reconstruction, Grace Building, York-street, Sydney.

All ex-servicemen who hold a Qualification Certificate under the War Service Land Settlement Scheme, irrespective of the date of their discharge, are eligible for the course and should apply direct to the Deputy Co-Ordinator Rural Training, N.S.W., Department of Agriculture, G.P.O. Box 36A, Sydney.

The course includes farm management, elementary veterinary science, animal production, and feeding. Specialist groups are formed from students interested in sheep and wool, mixed farming, pig- and dairy-farming and horticulture.

THE ATHEL TREE (*Tamarix (aphylla) articulata*).

Valuable for Shelter Belts

In Western Districts.

E. G. CUTHBERTSON, B.Sc.Agr.,
Agronomist.

CONSIDERABLE interest is being taken in the successful use of the recently-introduced Athel Tree (*Tamarix (aphylla) articulata*) for windbreaks to assist in reducing soil erosion in the western areas of the State.

It is the purpose of this article to set out some of the results achieved to date with this species and to describe its propagation and cultivation.

Wind erosion is a problem of major importance in the western districts of the State. Re-afforestation and re-establishment of the pasture cover are important factors in assisting to overcome it.

Herbage plants are most satisfactorily established when the mechanical force of the wind has been reduced, its dust content lowered and its power to cause evaporation lessened. Individuals can assist in reclamation work and at the same time protect their properties by the extensive planting of windbreaks and shelter belts in suitable locations. It is important, of course, that the vital sections of the properties such as the existing pasture areas and the stock watering tanks be protected first.

Choice of species is of vital importance when planting windbreaks. Deciduous trees for example are useless, even if the conditions for their growth are perfect. Evergreen, drought-resistant, densely-leaved trees are required for western conditions; they should, if possible, make rapid growth and provide stock feed in drought times. Many native trees fulfil the primary considerations, but most are slow growers, particularly in regions of low rainfall. Landholders in these areas will, therefore, be very interested in the success of the Athel

Fig. 1.—Two-year-old Athel Tree at Trangie.
Twelve feet high.

Tree (*Tamarix (aphylla) articulata*) recently introduced from U.S.A. when used for wind protection purposes.

Value Demonstrated in U.S.A.

Athel trees were introduced into Arizona, U.S.A., from Algiers in 1911 and their use has spread over the whole of the southwest of the United States. In recent years they have been extensively used for windbreaks and woodlots, providing shelter, fence posts and firewood. Smith[6] reports that nearly all new windbreaks in Arizona are planted to the Athel tree. It has been recommended as a windbreak for citrus groves in California since 1925 (Shamel[4]).

Introduction Into Australia.

Although other species of Tamarisk are fairly well known in Australia—*Tamarix gallica* is used extensively in South Australia—the advent of the Athel tree was purely fortuitous. Herriot[2] reports that Mr. Essington Lewis, noticing the trees growing in California, brought specimens back with him and had them planted at Whyalla, South Australia. In 1936 cuttings were taken from Whyalla to the Albert Morris Park at Broken Hill, and cuttings from the resultant trees have been used for extensive plantings in Broken Hill and elsewhere.

Good Results at Broken Hill.

The very serious effect of dust, both on machinery and living conditions, has been considerably reduced by the protection afforded by the regeneration areas, which have been totally enclosed from stock around three sides of the town and on which pasture and shrub cover has become re-established.

The planting of Athel trees has been of major value in checking the effect of sand blown from the mullock heaps of the mines. The "sand," previously unchecked and encroaching upon the town area, is now caught in dunes by the trees planted around the bases of the mullock heaps. These dunes are virtually anchored, little movement occurring. The trees survive this partial burial remarkably well, throwing out new shoots and roots close to the surface of the dune.

It is possible that shifting sand dunes in the north-west of the State may be stabilised by the use of this tree, but experiments are required to determine this point.

Natural Habitat.

The genus *Tamarix* is a native of Central Asia and the Mediterranean regions, where some sixty species are recognised. These are mainly found in saline or alkaline situations in the vicinity of lagoons, or on sterile, sandy areas typical of desert regions. However, species such as the English Tamarisk (*Tamarix anglica*), the Common or French Tamarisk (*T. gallica*) and the Chinese Tamarisk (*T. chinensis*) are readily adaptable to sandy loams and even well-drained garden soils (Mellor[3]). These species are deciduous, but because of their unique foliage and plumose, flowering spikes are in demand as ornamentals.

The Athel tree is not as widely distributed as, for instance, is *Tamarix gallica*. Because of its drought-resistance, its tolerance to alkaline and saline situations it is, however, well suited to dry sandy regions. Smith,[4] writing of Arizonan conditions, states that the tree thrives best in a hot, dry climate with plenty of sun, in medium to light loams. Some growth has been observed even in river sands. While growth is best when abundant water is available, stands were found around abandoned homesteads in areas of low and erratic rainfall.

Suitability of Western New South Wales.

Climatic conditions found in south-western Arizona closely resemble those found in the western districts of this State, except that the rainfall is somewhat higher in New South Wales. Climatically, therefore, our inland conditions seem to be even more favourable for the growth of Athel trees than those of Arizona.

Red soils of inland New South Wales, the Barrier Range and the north-west appear to be eminently suited to the growth of this tree. Adaptability to soil variations is amply demonstrated by results of large-scale plantings at Broken Hill and smaller "ornamental" plantings elsewhere in the west. It is not yet known whether the tree could be grown successfully on the black, self-mulching soils that occur in some areas. The author has no personal knowledge of such plantings and has been unable to find any reference to any, but the Athel tree does well on the grey soils of the Bourke district, similar in some respects to the true black soils. Extensive plantings on these soils cannot, therefore, be advised until suitability is known. Small pilot plantings could be made in positions where the trees could be observed easily. If the trees made good growth they would provide sources of cuttings for any large-scale plantings that might be contemplated.

Growth of the Trees.

Under favourable conditions the tree grows rapidly, increasing in height from 10 to 15 feet in a year. Rapid growth probably cannot be expected in the western districts, except under irrigation, but a closely packed windbreak could be expected in from five to six years. Trees planted individually as ornamentals at Trangie have attained a height of 12 feet in two years, while some one-year-old trees are 8 feet high.

Because of its rapid growth and low branching habit Athel tree is used extensively in Arizona and California as a single-row windbreak. Better results would probably be obtained under local conditions by its inclusion in a multiple-row windbreak if land is available. Windbreaks of the single-row type are usually only planted as special purpose breaks where cost of land, or smallness of the available area preclude the use of a multiple-row break; *e.g.*, around orchards or homesteads. In general Athel

tree should be used as a subsidiary row in a multiple-row break to provide rapid basal cover, and shelter to the slower-growing trees of the main row, which, in our inland conditions, are usually Eucalypts.

Athel trees are also well suited for stock watering tank protection. For this purpose they should be planted in several rows on the windward sides of the tank, the resultant break reduces evaporation and wind siltation considerably.

Athel tree should be planted at 10-foot intervals whether in single- or in multiple-row windbreaks. In multiple-row breaks the trees of any one row should be planted so that they are opposite the spaces between trees of adjacent rows.

Thorough preparation of the land is always advisable. Very little attention is necessary after planting but it pays to give trees a good start. Anderson[1] recommends a shallow ploughing in autumn, followed by a deep cross ploughing and harrowing prior to planting out. If possible "hole" planting without previous soil preparation should be avoided.

Where single-row windbreaks are planned, thorough soil preparation is essential in order to minimise the risk of misses in the row. This is also important in the case of orchard breaks because of future cultivation. Extensive lateral root systems with no large tap root are formed under dry conditions. Athel trees will, therefore, compete with neighbouring orchard trees unless action is taken to prevent competition. Shamel[4] advises trenching or subsoiling between windbreaks and adjacent orchard trees. These measures must be carried out to a depth sufficient to cut all lateral roots. Trangie experience suggests that this is dangerous in the first year or so. Root disturbance in the first year at Trangie gave the trees a serious setback.

Methods of Propagation.

Propagation of Athel tree is by cuttings. These are made from well-matured, current season's wood of pencil thickness, from a tree not less than three years old. They should be about 8 inches long with the basal cut close to a bud and the top cut about ¼ inch above a bud. Cuttings can be planted directly without further treatment, but a quicker strike is usually obtained by the use of one of the proprietary hormone activators. If these are used the instructions issued with the preparation should be strictly followed.

Good strikes of cuttings can be obtained by planting in what is to be the permanent position of the tree, provided that it is

Fig. 2.—A Single-row Windbreak of Athel Treesf or House Protection at Trangie.
These 1 year-old trees ,now 8 feet high, will need thinning as they get older. Branches have been removed from the base.

possible to water adequately. Soil around cuttings should be kept moist until they are well established. This method has been very successfully used by the Zinc Corporation at Broken Hill. The practice recommended is to dig a hole 2 feet x 2 feet x 2 feet and fill with a mixture of 60 per cent. sand and 40 per cent. loam. Cuttings are placed vertically in the centre of the hole, leaving about 3 inches projecting. Waterings should be sufficient to keep the soil continually moist. Young shoots will appear in from 2 to 4 weeks, but in some cases may take longer.

Fig. 3.—A Box of Cuttings Planted in Sleeves.

Where it is not possible to water *in situ* plantings, cuttings should be struck in tins about the size of kerosene tins. These should be filled to within 3 inches of the top with the sand loam mixture described. Holes should be made in the tin to provide drainage. Cuttings are planted vertically, leaving about 3 inches projecting, and the soil should be kept moist until the cuttings are well established.

When young trees are ready to be transferred to their permanent position, *i.e.*, when they are about 1 foot high, the bottom of the tin should be removed and the tin placed centrally in a hole 3 feet x 3 feet x 2 feet deep. Punch some holes in the side of the tin and then replace the removed soil, packing firmly around the tin; water in. The soil surface around the tin should be left saucer-shaped to concentrate any rainfall. Tins soon rust away and do not interfere with further growth of the tree.

Galvanised iron sleeves may also be used to hold soil in which to strike cuttings. These save space in the nursery, but young trees need more attention after planting out. Planting out is done when the trees are about 9 inches high in this case.

Sleeves are made out of pieces of flat iron 12 x 15 inches, bent into the form of a cylinder 4 to 5 inches in diameter. These are placed in a wooden box and filled with the sand loam mixture. Cuttings are inserted into the soil as before. When cuttings are established and about 6 to 9 inches high they are transferred directly to the field.

Field preparation is the same as for *in situ* plantings. Sleeves are easily removed without disturbing soil around the roots. Pack soil firmly around the young trees and water in. Trees will need watering at intervals until they become well established, that is, until they are about 12 to 18 inches high. Because of the extra attention required this method should be used only when water and labour are readily available, such as in the vicinity of homesteads or stock tanks, or in places where irrigation is possible.

When trees are 2 feet high prune to one selected shoot and stake.

Athel trees are hardy and require little, if any, attention when they are established. Care in the initial stages, however, always pays dividends. Stock find the foliage very palatable so that it is advisable to protect the young tree in some way, either by fencing in the area temporarily, or use of individual tree guards, until the tree is big enough to withstand such defoliations.

Acknowledgment.

The author wishes to express his appreciation to Mr. R. G. Fisher and Mr. J. Scougall of the Zinc Corporation, Broken Hill, for permission to use the information in that company's roneoed pamphlet, to Mr. Lindsay of Trangie and to the others who have taken an interest in this article and for the information they have so freely given.

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(*Continued on page* 402.)

LAWNS, GREENS AND PLAYING FIELDS.

The Establishment and Maintenance in Metropolitan Area.

FINE TURF PLOTS AT BOTANIC GARDENS.

(*Concluded from page* 296.)

H. R. RICHARDSON, B.Sc.Agr., Special Agronomist (Pastures).*

TO demonstrate the relative values of the accepted turf grasses for various purposes and to obtain more accurate information on a number of introduced species, the Department has established a series of miniature lawns at the Botanic Gardens.

In the first instalment of the article, in June issue, Mr. Richardson made general observations on these species. This month he discusses the points to be considered in the selection of grasses for various purposes and the cultural treatment involved in the establishment and maintenance of turf.

Selecting Grasses for Particular Purposes.

Apart from its appearance, texture and turf-forming ability, a number of other points must be considered when selecting a turf grass for a particular purpose. These are briefly discussed below.

Amount of Maintenance Required—Bent grasses are much more attractive in appearance than the Couch grasses, but they are difficult and costly to maintain. They are also susceptible to fungous attack and require copious watering in the summer months. For this reason, although they are used extensively on golf greens, they are not recommended for home gardeners in the Metropolitan Area.

Climate.—Extremes of temperature are undesirable and the prevalance of frosts may be a deciding factor in the choice of a species or strain. Species that do well in lawns in Victoria may be definitely unsuited for Sydney Metropolitan conditions. The height above sea level has a big influence on the suitability of species.

Water Supply.—Without an adequate water supply, the establishment of a lawn becomes very difficult but not hopeless, as some grasses do reasonably well under dry conditions. To bring a lawn to first-class condition, however, an adequate supply of water is essential. For this reason Bent grasses should never be sown where the water supply is uncertain or restricted in certain summer months.

Soil.—Some species are particularly suited to light, sandy soils: others prefer a fairly heavy loam. Most soils can be made to suit the needs of a particular grass; to do this the top six inches of soil should be brought to the correct texture for the species chosen. Unless it is intended to correct the soil, choose a species suited to the soil; in any case make sure that the soil drainage is good.

Availability of Supplies of Seed, Turf, etc.—Some species and strains must be propagated by roots or runners. In other cases, the seed is difficult to obtain. Before deciding on a particular grass, ensure that seed or roots are available.

Susceptibility to Fungous Attack.†—The Bent grasses are readily attacked by the fungous diseases dollar spot and brown patch. The control of these diseases is costly and requires constant inspection of the lawns or greens. Unless home gardeners are prepared to devote the necessary attention to them, they are not recommended to sow Bent grasses.

Brown patch and dollar spot are usually recognised by the presence of yellowish-brown patches on the grass. The size of

***Since this article was written, Mr. Richardson has been appointed Deputy Principal, Hawkesbury Agricultural College.**

† For further detail for control of brown patch and dollar spot, see departmental pamphlet, "Brown Patch of Turf," Plant Disease Leaflet No. 73.

these spots may vary from 1 inch in diameter to many inches, depending on the particular disease present. Before the brown patches develop, however, the presence of these diseases can be recognised by inspecting the turf when the dew is still on the ground. They then show up as white cobwebby strands. This is the best stage at which to treat them.

The recommended treatment for these fungous diseases is to spray the whole of the area of turf with a mixture of calomel (mercurous chloride) and corrosive sublimate (mercuric chloride); 1½ ozs. of each of these chemicals should be mixed with 50 gallons of water. This quantity is sufficient to treat 1,000 square feet of lawn. Care should be taken to stir the mixture continuously whilst applying, as calomel is insoluble in water and must be kept in suspension. The cost of the chemicals to treat 1,000 square feet is approximately 2s. 6d. It may be necessary to treat the area several times during the critical period, which normally occurs during late summer.

Suitability of the Grass.—A grass selected for use on putting or bowling greens must be able to stand up to the playing conditions for which it is intended. The appearance of a grass is not always an indication of its ability to withstand traffic.

Establishment and Maintenance of Turf.

Consideration having been given to the selection of a suitable species, attention to the following cultural treatments will reduce to a minimum most of the risks associated with the establishment and maintenance of satisfactory turf.

Good Drainage is the First Essential.—Most fine turf grasses require good soil drainage. While deep, sandy soils are naturally well drained, clay soils often require some form of artificial drainage. Any defect in this regard should be corrected before commencing to prepare the top soil for sowing.

The usual indications of a badly-drained soil are the presence of weeds and moss and unhealthy growth of the turf grass. In extreme cases the soil has a sponge-like feel. To overcome this condition it is necessary to instal some system of drainage to remove the excess moisture in the soil.

Agricultural pipes are usually used for this purpose. These may be 3 or 4 inches in diameter, depending on the area to be drained. When laying the pipes, it is customary to set them out according to the "herringbone" system, which consists of main pipe lines joined at an angle of approximately 40 degrees by lateral pipe lines. The laterals should be laid diagonally across the likely direction of flow of soil water so as to drain as much water as possible. The spacing of laterals will vary in different soils, but they should be approximately 10 to 18 feet apart.

Pipes may be laid at a depth of 18 inches to 2 feet, but should be set so that there is a fall of 1 in 100 (for small areas) towards the outlet. Before covering the pipes, it is advisable to test the drains by pouring water in them at the highest level so that it can be seen that they are functioning satisfactorily. Attention should be paid to the disposal of excess drainage water.

Prepare the Soil Well Beforehand.—The best lawns and greens are established on sandy loams. Excellent turf can be grown in these soils provided adequate water and fertiliser is supplied. Many failures have occurred on the northern side of Sydney Harbour, mainly because the soils generally in this region are heavy clays and as such are unsuitable for the growth of turf grasses. In most cases they require the addition of lime or dolomite (approximately 50 to 100 lb. per thousand square feet of lawn), sand and organic matter. These materials should be incorporated in the top 4 to 6 inches of soil prior to sowing.

See that the Lawn Receives Adequate Sunlight.—Although some species of turf grass are more tolerant of shade than others, all turf grasses require considerable sunlight for satisfactory growth. Where the situation is too shady, the turf is always thin and rapidly becomes infested with moss and other weeds. While moss and some weeds may be temporarily removed by the use of chemicals, they will re-appear unless the cause of shading is removed. In some instances, it is not only impracticable but also undesirable to remove the cause of shading.

which may be an ornamental tree or building; in cases such as these, it should not be expected that satisfactory turf can be established.

A Weed is a Plant Growing Out of Place.—Once a lawn or green is established, it is often expected to remain *in situ* indefinitely. With this fact in mind, therefore, no attempt should be made to plant an area to turf until it is apparent that all weed seeds present in the soil have been germinated and killed.

The intended area should be well cultivated before sowing. To encourage weed seed to germinate, frequent waterings should be carried out. As each crop of weeds appears and before the plants have an opportunity to set seed, they should be destroyed by digging in. In some cases, it may be necessary to destroy several crops of weeds, but care and attention in the early stages of preparation will pay dividends at a later date.

Some seed as purchased contains many weed seeds. Only the best quality seed should be purchased from reputable seed firms. Soils used for top dressing often introduces weed seeds. When topdressing an area, see that the soil comes from an area comparatively free of weed seeds.

Seed Should be Sown at Correct Depth.—Seed of all turf grasses is very small. Many failures have resulted from sowing at too great a depth. Seed should not be sown deeper than ¼ inch, and once sown should be kept well watered.

Establishment by Roots, Runners or Sods.—In certain cases where it is not possible to obtain seed of some grass species, it is necessary to establish the turf by roots, runners or sods. Turfing the whole area by using sods is an expensive procedure and money may be saved by simply using small sods several inches square and placing them approximately 6 inches apart.

Another method of establishing turf is by the use of roots or runners. These should be sprigged into the ground so that they are 6 inches apart in each direction. A method used by certain contractors to turf bowling greens is to chaff up couch grass runners with a single blade chaff cutter. This material is spread over the whole surface and lightly covered with soil to a depth of

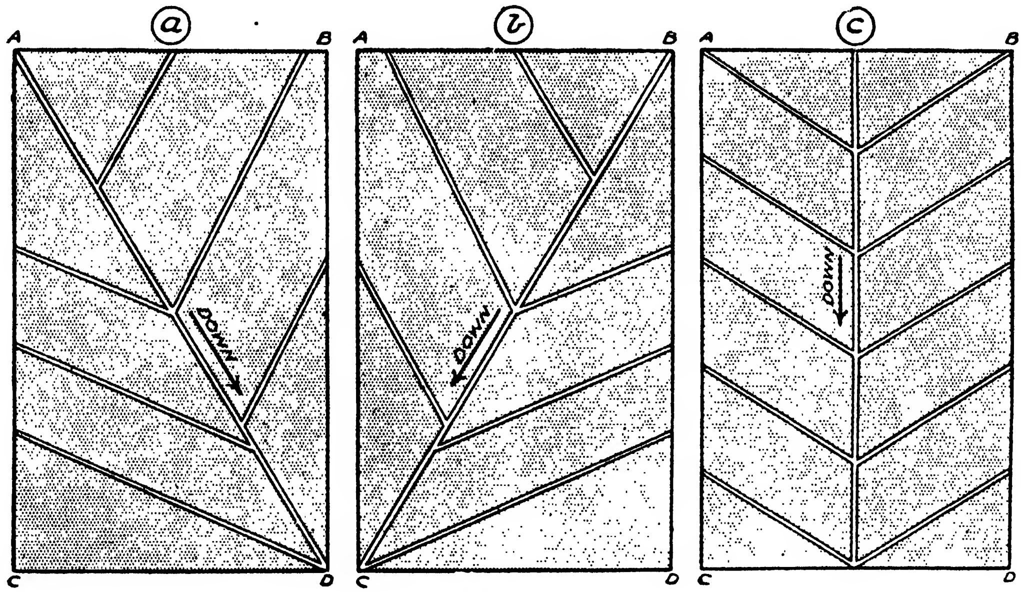

Diagram of Drainage Systems for Small Areas.

(*a*) Ground falls from A to D.
(*b*) Ground falls from B to C.
(*c*) Ground falls from AB to CD or does not slope

[*After Beale.*

¼ inch. With all three methods, the soil should be kept moist by frequent watering until the grass is established.

Time to Sow or Plant.—Some grasses only grow during the warmer months. Others grow better in the cooler months of the year. The grass that is selected should be sown at the correct season of the year. Summer-growing grasses, such as couch, should be sown from October until February, whereas winter-growing grasses such as Bent grass do best when sown at the latter end of February.

Use Fertilisers and Use Them Sensibly.—At the time of sowing or planting the soil should receive an application of a complete fertiliser. The fertiliser recommended is one containing six parts sulphate of ammonia, three parts superphosphate and two parts muriate of potash. The rate of application recommended for this fertiliser is approximately 8 lb. per thousand square feet.

This fertiliser treatment should be repeated each year at the commencement of the growing period of the particular species. For couch, this will be September-October; for Bent grasses, February-March, depending on seasonal conditions.

Summer-growing grasses such as couch should receive applications of sulphate of ammonia at intervals of 6 to 8 weeks throughout the growing season. The rate of application recommended is 3 lb. per thousand square feet. These applications may commence in October and continue until the end of March. They should not be continued into the cooler months of the year as this will only encourage winter-growing weeds.

Winter-growing grasses such as Bent should receive the same fertiliser treatment as that recommended for couch, except that applications of sulphate of ammonia should be confined mainly to the cooler months of the year, i.e., March to September. For these latter grasses, only sufficient sulphate of ammonia should be applied during the summer months to keep the grass healthy, as excessive use of nitrogenous fertilisers in the warmer months encourages the growth of couch grass and renders the Bent, etc., more liable to fungous disease.

The thin, unhealthy appearance of many metropolitan lawns and greens is almost entirely due to the failure to use fertilisers, or at least, to use them intelligently. In most cases they could be transformed by the efficient use of fertilisers, together with adequate watering.

Use Water Intelligently.—It is preferable to apply water in the form of a few heavy applications, rather than frequent, light waterings. Water penetrating to a good depth in the soil encourages the development of a deep root system, whereas surface water that only penetrates a little distance results in a shallow root system, rendering the plants more susceptible to drought injury.

The Athol Tree—*continued from page 398.*

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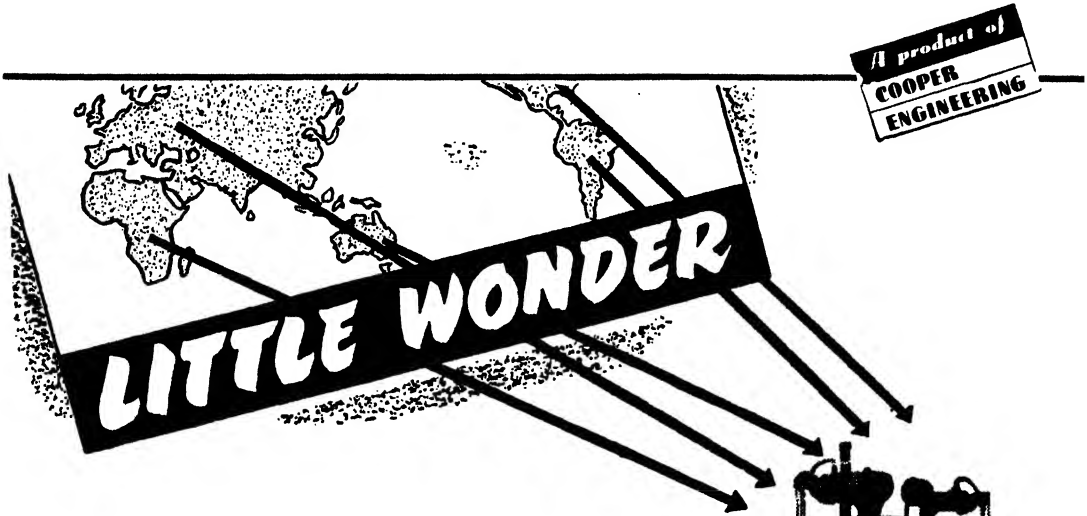
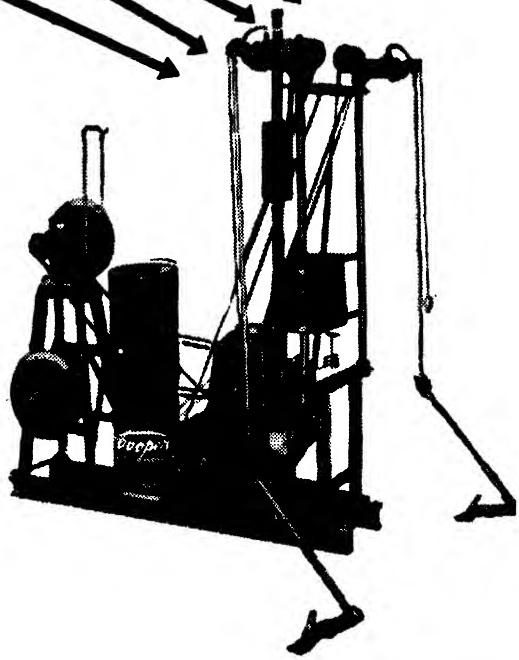
GRAIN sorghum has again shown its adaptability to irrigation in inland areas by high yields obtained in a variety trial at Yanco Experiment Farm. The highest yield in the trial, 112 bushels per acre, came from a new variety, *Caprock.* It was followed by *Plainsman,* 102 bushels per acre; *Wheatland Milo,* 94 bushels; *Westland,* 83 bushels; *Martin,* 82 bushels; and *Kalo,* 81½ bushels.





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THE DRIFT TO THE CITIES.

IS IT A BAD THING?

DIFFICULTY in obtaining suitable labour on many farms in New South Wales during recent years has redirected attention to what has commonly become known as "the drift to the cities." Statements are frequently made to the effect that the drift of the farm people to the cities is threatening Australia's future, that rural industries are being robbed of their labour force, and that the only salvation lies in stopping the flow of labour to the towns and turning it back to whence it came, namely the farms.

A superficial glance at the movements in population in this country during recent decades appears to provide support for such statements. The birthrate is considerably higher in rural areas than in the cities, but in spite of this, between 1921 *and* 1947 *the rural population of Australia rose by only* 25 *per cent. as against a rise of* 65 *per cent. in the population of metropolitan areas. But more significant still is the fact that between the same years the number of persons engaged in rural industries actually fell by approximately* 18 *per cent. Any increase in the rural working population was restricted to the country towns.*

By far the most striking feature has been the tendency for more and more people to migrate to the larger cities. But is this a serious problem as far as agriculture is concerned? Is the drift to the cities detrimental to the economy in general and to the prosperity of farmers in particular? Is the drift to the cities, which has been taking place for many decades, the real cause of the present shortage of labour on a number of farms in New South Wales?

Population and Agriculture.

Reference to the position in other countries throws some light on these interesting questions. The figures shown in Table I illustrate that, without exception, countries with a high standard of living, like the U.S.A. and Great Britain, have only a surprisingly small proportion of their people working on farms. This applies even to countries with large export surpluses of primary products, like Australia and New Zealand. On the other hand, countries with a low standard of living, like Italy and Japan, have a very large proportion of their bread-winners engaged in farming.

TABLE I.

Country.	Average Real Income per Head 1925-34, of Working Population. International Units.	Percentage Breadwinners engaged in		
		* Primary Industries.	† Secondary Industries.	‡ Tertiary Industries.
U.S.A.	1,368	19·3	31·1	49·6
Canada	1,337	34·5	23·2	42·3
New Zealand	1 202	27·1	24·2	48·7
Great Britain	1,069	6·4	43·9	49·7
Switzerland	1,018	21·3	44·9	32·8
Australia	980	24·4	-9.4	46·2
....	......	......	......	......
....	......	......	......	......
Japan	353	50·3	19·5	30·2
Poland	352	61·6	18·0	20·3
Italy	343	42·9	31·1	26·0
U.S.S.R.	285	74·1	15·4	10·5
Bulgaria	284	67·3	17·4	15·3
India	110	6.·4	14·4	23·2

* Farming, Forestry, Fishing.
† Mining, Building, Factories.
‡ Commerce, Transport and Services.

Furthermore, as the standard of living in various countries in the world has increased, the proportion of persons engaged in primary industry has declined. This is illustrated with four typical examples in Table II, which shows the percentage of total breadwinners engaged in agriculture, and the average real incomes, in U.S.A., Great Britain, Australia and Japan as at approximately 1890, 1910 and 1930.

TABLE II.

Country.	Percentage of Total Breadwinners Engaged in Agriculture.			Approximate Average Real Income Expressed in International Unity.		
	1890	1910	1930	1890	1910	1930
U.S.A. ...	46	32	22	960	1210	1400
Great Britain ...	10	8	6	750	900	1100
Australia ...	31	30	27	650	720	930
Japan ...	77	61	53	70	100	300

Why should this trend be consistent with a rising standard of living in a country like Australia? There are two aspects to this problem.

1. The Demand for Farm Products.

To keep alive, people need an income large enough to buy their basic needs, e.g., clothing and cheap foods such as bread, potatoes and meat. These we may call essentials, because they are man's minimum needs. But once these needs are satisfied the demand for more food does not increase very much. People then do not want a much greater bulk of food. They will, of course, seek a greater variety and tend to substitute some of the more expensive foods like milk, eggs and butter for cheaper and more basic types. But most of their surplus money will be spent on manufactured goods other than foodstuffs, and on such services as travel, amusements, education, etc.

This is exactly the position in Australia to-day, and before the war was also the case in most of the world's markets within the range of the Australian primary producer at the existing costs of production. Furthermore, both in Australia and in the overseas countries which buy most of Australia's exports of primary products, population is increasing only at a very slow rate. The result is that with any further rise in real incomes in this country only about one quarter of that rise will be spent on farm products. A similar position will hold again in our main overseas markets when world production and trade return to normal. More and more labour will tend to be absorbed by secondary and tertiary industries in this country in order to meet the more rapidly growing demand for their products and services.

But there has been quite a significant rise in population in this country, and also a considerable expansion in the export of primary products over recent decades. (See Table III). Under these conditions, why has the number of persons engaged in farming actually declined?

TABLE III.

Trends in Exports of Farm Products; Population; and Primary Industry's Labour Force. (Australia).

	Average 10 years ended		
	1920/21	1930/31	1940/41
Exports:			
Wool (Greasy) ...... Million lb.	604·32	802·53	898·54
Beef ...... 000 Tons	76·78	73·83	97·30
Mutton ...... 000 Tons	36·05	15·10	18·73
Lamb ...... 000 Tons	14·35	23·49	69·00
Wheat ...... Mil. Bus.	44·56	71·76	78·55
Butter ...... Million lb.	63·46	106·39	220·67
Total Population ...... million persons	4·95	6·05	6·79
Total persons engaged in primary industry* ...'000 persons	453·94	441·53	425·60

* Excluding pastoral industry in Queensland.

2. Increasing Output per Worker in Agriculture.

Along with the increasing opportunities for employment in secondary and tertiary industries to meet the changing demands of

a rising standard of living, great progress has been made in farming efficiency. On the average each farmer in New South Wales to-day cultivates about three-quarters as much again as his father did in 1914. The production of milk and wool per person engaged in these types of farming has increased by more than 50 per cent. Improved methods resulted in agriculture being able to meet past expansion in the demand for farm products, without an increase in its labour force.

This does not mean that the farmer to-day is necessarily a better man than his father. The present day farmer worries less about transport and marketing problems; he uses tractors instead of horses; and he purchases many materials which his father spent time producing on the farm. In other words, he is becoming a production specialist; with the adoption of modern methods his labour requirements are being continually reduced.

A declining number of farmers and farm workers has in the past been conducive to increasing efficiency. Furthermore as labour costs in Australia's primary industries amount to approximately 50 per cent. of the total costs, it is unlikely that greater efficiency in future is to be attained by the use of more labour. And it is only by reducing costs of production that Australia can hope to obtain permanently a greater share of the world's markets for primary products without lowering farm incomes and the general standard of living in the country.

What is the Real Meaning of the Drift to the Cities?

The drift to the cities is merely a reflection of the expanding needs for labour in secondary and tertiary industries. In order to support a rising standard of living, it is essential that these needs be satisfied.

The reasons why the drift of population in Australia is towards the cities are simply:—

1. Secondary and tertiary industry have tended to develop in the cities.

2. The birthrate is considerably higher in country areas than in the cities.

3. The slow rate of increase in the demand for more farm products, coupled with rapid improvements in farm mechanisation and farming methods are tending to reduce the labour requirements of primary industry.

Obviously the solution to the problem of more and more people accumulating in the cities, is not to reverse the movement of workers from the farms to secondary and tertiary industries, but rather to decentralise secondary industry.

In fact the question might well be asked: "Has the movement of labour from primary to secondary and tertiary industries been rapid enough in the past?" If this were not the case it is likely that the relative earnings of farmers would be lower than those earned in other occupations. That is, too many would be seeking a share of the gross income from primary industries. Furthermore an excess of labour in this sense would impede the adoption of improved techniques and increased efficiency in the industry.

Such a possibility should not be overlooked. In the U.S.A., for example, before the war the relative earnings of persons engaged in farming was only approximately 40 per cent. of that in other industries. It is quite commonly agreed in that country that the problem of excess labour in agriculture, particularly in the southern areas is a very serious one. The problem, it is believed, has resulted from a failure on the part of other industries to offer such expanding opportunities and security of employment as would attract this surplus labour from the land.

In Australia the average earnings in primary industry as a whole, and other industries have been fairly comparable in the past. However, during the thirteen years ended 1940-41, while the average earning in all types of farming taken together was £330 per annum, the average in the pastoral industry was £580 per annum but in the dairying and agricultural industries only £233 and £214 per annum respectively. There is a reason to believe, therefore, that in the latter two industries there has been excess labour in the sense that—

(*a*) From the point of view of the standard of living in the country as a whole, some of their labour could have been more profitably employed in other work.

(*b*) In these industries, the adoption of improved techniques has not taken place

rapidly enough for maximum efficiency to be achieved.

The Present Shortage of Labour on Farms.

It is essential not to confuse the present shortage of farm labour with the fundamental trend of a declining proportion of persons engaged in farming. The latter as we have seen is a necessary condition of a rising standard of living.

The shortages of farm labour in recent years resulted from the very rapid movement of rural manpower to munitions, industries and the armed Services during the early part of the war. The number of persons engaged in farming in New South Wales fell by 19,300 (14 per cent.) between 1939 and 1943. This decline was much more rapid than would normally have occurred as a result of the long term trend of drift to the cities. The war trend too, was largely of a temporary nature. By 1947 30 per cent. of the loss had been made up, and the numbers are still increasing.

In total the present shortage of rural labour is not as acute as particular reports and examples might indicate. The real shortage is of experienced, good quality labour, that is, labour for which the farmer is prepared to pay the ruling level of wages. It is also important to remember that during recent years shortages of materials and machinery have hampered the adoption of improved farming methods and that this has accentuated the labour problem.

Actually, the wartime shortage of labour has been an incentive to farmers to adopt mechanisation and other labour-saving methods and in all probability the pre-war number of persons engaged in farming will never be recorded again. On the basis of history this will be merely a sign of progress.

The Best Potential Labour Must Be Retained on Farms.

From the foregoing discussion it is clear that at least apart from the present and temporary shortage of rural labour, the long term decline in the numbers of persons engaged in farming has not been detrimental to primary industry. What is needed is not a numerically strong primary industry, but an economically healthy one; that is, an industry capable of returning its members an income comparable with that earned in other sections of the economy.

The extent of the drift to the cities is of little importance to agriculture. But what is very important is the type of potential rural worker and farmer who responded to the "call of the city." Farming is a business which has a complicated and variable nature, and to be managed efficiently it must attract and retain the best of its potential labour force. In the past this has not been the case. "Talent erosion" of farm people has been perhaps equally as serious to the industry as a whole as has been the more easily seen soil erosion.—WYN. F. OWEN, Economics Research Officer.

Production of Registered Commercial Hybrid Maize Seed.

THE Department of Agriculture has extended until 17th September the closing date for receipt of applications by farmers who desire to participate in the scheme for the production of registered commercial hybrid maize seed.

Trials in this State have shown the yield increases the result from the use of hybrid seed. The scheme will enable growers to produce registered commercial hybrid seed from inbred seed maize or single cross hybrid seed raised by the Department for distribution to growers.

Details of the conditions which govern this scheme were published in the June issue of the *Agricultural Gazette*, and are available on application to the Department.

FRUITGROWING.

SUPERFICIAL SCALD OF GRANNY SMITH APPLES.

H. BROADFOOT, Deputy Chief, Division of Horticulture and E. C. WHITTAKER, Fruit Officer.

THE Granny Smith apple is grown very extensively in New South Wales, and does well in all the chief apple-growing districts.

On the whole the cropping is regular and the production compares very favourably with that of any other variety of apple grown in the State. To the producer it is amongst the most profitable of apples, not only because of the foregoing qualities, but because, in addition, it is an excellent export variety, keeping well in common and cold storage—much longer, of course, in cold storage.

When held in cold storage for long periods, however, the Granny Smith apple becomes very susceptible to scald, and if provision is not made to guard against this trouble, heavy losses may result.

There is a heavy and increasing production of Granny Smith apples in this State, as in other States of the Commonwealth, and in view of the popularity of this variety on our own and oversea markets, every possible effort should be made to present this apple to the consumer in the best possible condition. If effective steps are not taken to prevent scald in Granny Smith apples which are to be held for long periods in cold storage, adverse results are likely to follow, especially in the sales of this apple late in the season.

What is Scald?

It may be well, before proceeding, to state briefly what scald is, and to describe its effects upon the fruit. Scald has been

Granny Smith Apple Trees, Batlow District.

found on other varieties of apples such as Rome Beauty, Delicious, Statesman, etc., but not nearly to the same extent as on Granny Smith.

Apple scald may be defined as a superficial brown discolouration of the skin. It occurs upon the fruit in storage, or after removal from storage. Investigators report it as resulting from the deleterious effects upon the epidermal tissues of gases given off from the apple.

Scald usually affects only the surface layers of cells, but in later stages it may extend into the flesh cells. Scald may occur in small spots, or on a small portion of the surface, or over the whole area giving the apple a tinted brown appearance. It may develop on fruit in store, or even fruit apparently quite sound at the time of removal may develop heavy scald within a few days or more after removal.

This latter characteristic, in particular, makes the incidence of scald a serious matter from the marketing point of view, as, very often, fruit is taken from the cool store in apparently excellent condition, only to develop heavy scald in anything from two to ten days after removal. Thus, a grower may forward his fruit to market in all good faith, believing it to be a good, blemish-free sample. Yet in a day or two, when it has had time to reach the retailer, it may have developed scald to such an extent as to be more or less unsaleable.

Oil-impregnated Wraps Control Scald.

Experiments conducted by the Department have given conclusive proof that practically 100 per cent. control of scald can be effected by the use of oil-impregnated wraps, and it has been the standard practice for years in this State to oil-wrap all Granny Smiths intended for cool storage for any length of time. Generally speaking, the output of this variety from New South Wales stores has been highly satisfactory so far as the incidence of superficial scald is concerned.

However, several points in the picking and storage of Granny Smiths play an important part in the development of scald, and it is the intention here to deal with each in turn.

Maturity.

Maturity is one of the most important factors in the storage life of any apple, and particularly Granny Smith intended for long storage. The more immature the Granny is when stored the more chance there is of severe scald developing, but, on the other hand, if the apples are over-mature when picked, there is a good chance that they will yellow up considerably in store—to the detriment of their sales value later on, as the trade nowadays demands a good green colour in Granny Smith.

However, owing to this demand for green-coloured Granny Smiths, there has been an increased tendency amongst some growers during the past few years to pick the apples more and more on the green or immature side.

Obviously it is of little use to retain a good green colour if the apples show a high percentage of scald or lack flavour on account of immaturity after removal from the cool store.

Of the three evils, viz., scald, immaturity and yellow colour, the last mentioned is by far the least serious.

Packing Bare or in Plain Wraps.

It has been demonstrated by tests over several seasons that the Granny Smith will develop little or no scald for limited periods, if packed either bare or in ordinary plain sulphite wraps—provided it is reasonably mature when picked. Plain wraps exercise little or no control over scald, and hence so far as this trouble is concerned the fruit may just as well be packed bare.

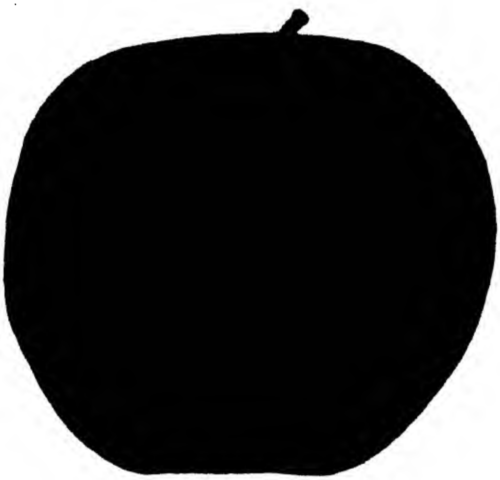
In the case of highland-grown Granny Smith, the period during which it is reasonably safe to cool store this type of fruit is limited to three or four months, and the apples should be removed from the store by the end of July at the very latest.

It is suggested, therefore, that if for any reason oiled wraps should be in short supply, all fruit not suitable for long storage, such as that from young and very lightly cropped trees, large over-grown fruit, "D" grade, and even some "good" samples could be treated in this fashion and marketed early, thus leaving the oiled wraps for the better-class fruit capable of being held until late in the season.

Delayed Storage.

It has been the general practice in the past to hold Granny Smith in common storage for varying periods. This period of

common storage varied from a week or two to as much as six weeks and longer. Of itself this common store period is of very limited value in scald control, unless carried to extremes, when such assets as colour and ultimate cool storage life are sacrificed. However, it has been demonstrated more than once in the past that a



Granny Smith Apple showing Superficial Scald.

common store period of up to two weeks for highland-grown fruit does no harm, and is, in fact, a very definite advantage in conjunction with the use of oiled wraps.

In any case, apart from its effect on scald development, common storage for this period allows of the crop being harvested without interruption, and in addition allows a period during which pears and short storage apples can be packed out of the cool store to make room for the Granny Smiths. Furthermore, it allows any troubles such as codling moth infestation, stem punctures, bruises, etc., to become more apparent and easily detected when packing, thus very often saving a good deal of extra labour and trouble in repacking later on.

An excessive period of common storage is likely to curtail seriously the cool storage life of the apples, and in addition result in too much yellowing for present trade requirements, whilst the danger of losses from such physiological disorders as lenticel spot, etc., is increased after a certain time.

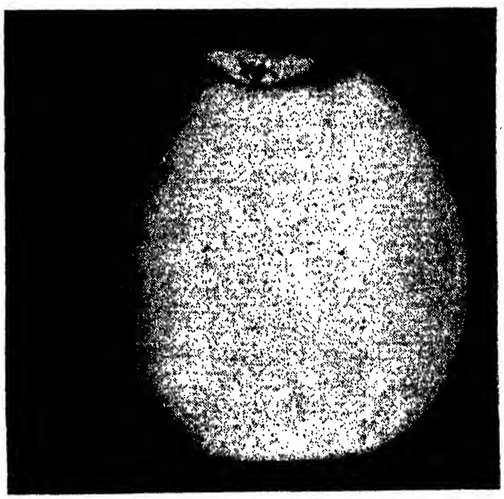
The Use of Oiled Sheets.

In the event of a shortage of oiled wraps oiled sheets of heavy grade paper have proved to be an effective substitute. The purpose of using oiled wraps for scald control is to have sufficient oil distributed evenly throughout the case to absorb and neutralise the volatile gases given off by the fruit during storage. The wrapper itself is merely a convenient carrier for the oil, and most commercial oiled wraps contain approximately from 13-14 per cent. of a special type of odourless and tasteless oil.

When using the oiled sheets an endeavour is made to supply approximately the amount of oil required throughout the case, but in a simpler manner than with wraps. This is accomplished by using large sheets of heavy paper, cut slightly larger than the inside dimensions of the standard bushel case, i.e., 19 inches x 12 inches, and impregnating them with the special oil previously mentioned.

In practice, a sheet of this oil-impregnated paper is used for each side of the case, a sheet at the bottom of the case and other sheets between each two layers of fruit—which can be packed bare. A sheet over the top layer completes the operation, thus giving a total of nine sheets to a six-layer and eight sheets to a five-layer pack.

When sheets are used in this way, it has proved possible to keep Granny Smith



Normal Granny Smith Apple.

apples in excellent condition until November, and for all practical purposes the control of scald is almost as efficient

(*Continued on page* 413.)

LIME-INDUCED CHLOROSIS OF FRUIT TREES

On the Murrumbidgee Irrigation Area.

J. R. DAVISON, Fruit Inspector.

FRUIT trees growing on highly alkaline soils on certain parts of the Murrumbidgee Irrigation Area have been observed to exhibit symptoms which it has been shown result from a deficiency of iron in the soil.

This article describes the condition and gives details of experiments which indicated an effective method of applying sulphate of iron to the soil to correct the deficiency.

Lime-induced chlorosis was first noticed to be affecting peach trees on two farms in the Yenda District in 1940, although it was not recognised as such at that time. It was later (1945) found to be affecting quince, apple and apricot trees in other parts of the same district.

Work done on zinc deficiencies a little earlier in Leeton,[1] had shown that certain fruit trees on the Murrumbidgee Irrigation Area could be very greatly improved in health by the application of zinc sprays to trees in a dormant condition, or in leaf, according to variety, and it was at first thought that the condition of the trees in Yenda might be due to a similar deficiency.

The Condition.

The condition of the leaf is somewhat different from that caused by deficiency of zinc, but in the earlier stages, as in 1940, there was a rather similar mottling effect. In the early stages of this trouble, the primary leaf-shoots are quite a normal green, but as they unfold, and laterals develop, they gradually lose their green colour except for the mid-ribs and veins. Although normal in size, they are often so pale in colour as to be virtually white.

Observations made on a block of mature peaches between 1940 and 1945, showed no other effect than this very pale green to yellow foliage. Fruit set and ripened, and laterals developed as they did on normal green trees adjacent to them. However, in 1945-46 a number of these trees failed badly; the fruit did not size and the trees made practically no annual growth.

In the same year, 90 per cent. of another block of younger peach trees, in which the condition was far more widespread and where very deep and frequent tillage was the rule, failed to start in the spring, and as a result the whole block was uprooted.

About this time, too, the condition was seen to be affecting quinces and apples. These are affected in much the same fashion, and show yellow leaves, little or no annual extension, die-back in spurs, and lack of fruit-set. Sometimes there will be an initial leader growth of several inches, but by the end of the season it will be entirely browned off.

It would seem that the condition does not become evident until the trees start to crop, or until the bad effects of too deep and too frequent tillage make themselves felt. The sudden occurrence of the trouble in 1940 may possibly be due to the incidence of the extremely wet winter in 1939. Heavy leaching of soluble salts into the subsoil and later increase in salinity in the topsoil, would most likely bring about a state of unbalance in plant nutrients which, coupled with the high lime content of the subsoil, produced the ill effects in the trees.

Soil Types Affected.

The actual soil-types affected are variable as far as surface soil is concerned, but they have one common condition, a highly calcarious subsoil. So far as is known to the writer, affected soils are confined to the mallee soils, Jondaryan loan (variable phase), and Beelbangera clay loam where this heavy soil is adjacent to the second mentioned.[4] Mallee soils are quite permeable, and overlie the limestone marl more or less directly. Jondaryan loam is not considered to be a particularly permeable soil, although it can, and does develop a water-table where irrigation is not controlled within safe limits. Beelbangera clay loam is

one of those peculiar heavy clays which are far more permeable than their texture and structure would suggest, and often react under irrigation like a much lighter soil altogether.

Soils in which affected trees are growing were tested and found to be highly alkaline —pH 8.0 to pH 8.5—whilst those from nearby unaffected trees were, at the worst, pH7.5. This fact explains why no soil top-dressings of iron salts have had anything but a fleeting effect on the health of the tree. The added iron is simply locked up, as is the naturally occurring iron in the soil, and is not available to the tree.

Injection Experiments.

In 1941, some initial injection work was done, using boron, zinc, copper, manganese and magnesium salts, and iron sulphate. All but iron were discontinued, as they had no noticeable effect whatever on the condition. Iron sulphate at the strength used, 0.5 per cent., was far too severe on the peach limb injected, when the technique described by Roach[5] of East Malling, England, was followed. With this method injection is continued until the first signs of marginal drying of the leaves on the limb. At this stage the apparatus is disconnected. However, probably owing to the very high rate of evaporation that obtains on the Murrumbidgee Irrigation Area the intake is apparently so great, that by the time the first signs of drying out take place, too much iron has already been taken in by the tree. Within 24 hours leaves are burnt right off and the limb eventually dies.

A trial injection of a calcium salt at this time reproduced faithfully the symptoms that occur naturally.

No further opportunity occurred to continue this work until the 1946 spring, when it was found that the younger block of peaches had died out, and that the older peaches in Mallee soil had shown quite a sudden decline.

In the spring of 1946, 0.5 per cent. solutions of iron citrate and iron phosphate were injected into limbs of both peach and quince trees. The technique followed was close to that of Roach, with the difference that when about a pint of solution had been taken up, the apparatus was disconnected.

On the peach trees no effect was discernible for about 12 hours, when the leaves showed a decided re-greening, which soon turned to a dark russet. Within a day or two most of the leaves dried and fell off, and the limbs subsequently died. The quinces were not so badly affected by the injection as the peach, for although the leaves became quite russetted, they did not fall, and after a while most of them returned to the deep green which had first appeared. It is interesting to note that quince limbs half the size of those injected in the peach trees, took the solution at the same rate. Although the solution was far too strong, its use indicated quite clearly that the condition was due to a lack of iron in the tree.

Other peach trees on the same farm were treated, but this time using 0.1 per cent. solutions of the same salts and the same quantity of fluid per limb. The effect, though taking longer to show up (over 24 hours) was definite, and moreover, lasted for the whole season. In the next season, however, the limbs reverted to about 50 per cent. of their original condition, and all the leading extensions were chlorotic.

Quinces treated similarly and at the same time were also affected the same way, although the reversion was not confined to any particular part of the limbs. Spur and laterals systems alternating erratically up the limb were partly yellow and partly green, and some of the earlier leaves on the laterals and leading shoots were green at first but reverted to yellow as the season advanced.

Practical Application of Treatment.

Having ascertained that the condition was due to a lack of iron in the tree, the next step was to find some reasonably easy way of getting the iron into the tree. Liquid injection into the tree is probably too involved for commercial application, and the methods of solid injection described by Batjer and Luce[3] have the defect of many holes bored into the trunk of the tree.

Work done in South Australia[2] suggested that one of the methods there described might be profitably applied here. This method, called "the crow-bar method," was devised so that several plugs of iron sulphate could be concentrated in positions around the tree at a depth which would

bring them into contact with roots, and at the same time provide a bulk of material which would take some time to be rendered unavailable to the tree.

In this method, eight crow-bar holes are sunk 18 inches deep, at even intervals, and at 6 feet out from the butt of the tree. Into each of these holes is placed ½-lb. of iron sulphate. The authors state that the best results were obtained by making the application early in the spring, and in a soil recently irrigated or quite moist.

On the Murrumbidgee Irrigation Area, the application were made somewhat later. On 4th November, shortly after the second irrigation, two peach and two quince trees were treated in each of the following ways:—

1. Crow-bar hole method, as described above.

2. A similar method, using 1-inch soil auger for boring the holes. This innovation was introduced as the writer considered that the type of hole made by a crowbar in wet soil was not quite adequate, in that it resulted in too concentrated a lump of iron sulphate at a depth, which under Area conditions, is really deeper than the main root zone. Auger holes 18 inches deep by 1 inch in diameter were filled practically to the surface with iron sulphate, thus making columns, each of which effectively spanned the depth of greatest concentration of the roots. The holes were also put a little further out—in the case of the peaches, nearly under the leaf-drip.

3. Soil top dressings at 4 lb. per tree, hoed in as soon as the top soil was in suitable condition.

By 16th December all trees in treatments 1 and 2 were greatly improved; practically all leaves had re-greened, and the trees were of normal colour except for odd laterals which were quite unchanged, and which stood out markedly against the green of the rest of the tree. In other instances, and particularly with Treatment 1, leaves were russetted with an excess of iron, although this soon faded to a deep green.

The topdressed plots were not improved at all, although some iron was absorbed, as was shown by the russetting and later abscission of a few leaves low down on the eastern side of the trees.

On 12th January observation showed that as well as re-greening almost 100 per cent., trees of treatment 2 had put out normal leader and lateral growths. Trees in treatment 1, while showing the same good growth as 2, tended to show a little reversion to the original yellow condition, particularly in the upper parts of the tree in shoots developed since the previous inspection.

By 3rd March, the peaches in treatment 1 showed rather more signs of reversion, though this was confined to certain limbs on the north-west arc of the tree. The quinces were not nearly as good, showing an overall reversion of about 25 per cent., although this was confined to the upper reaches of the trees. At the same time some of the leaves low down were quite russetted. It is most probably that this difference between the peaches and the quinces was due to the fact that the latter were growing on a much shallower soil, and could be expected, as a consequence, to be shallower rooted. In treatment 2, both peach and quince trees were holding colour well, and the extension of both leader and lateral were as good as that of normal trees outside the affected area.

It is thought that the effect will have worn off after two seasons, and that the treatment will then have to be repeated.

Summary.

1. It has been proved that trees show a deficiency of iron in certain soils of the Murrumbidgee Irrigation Area which have a highly calcarious subsoil.

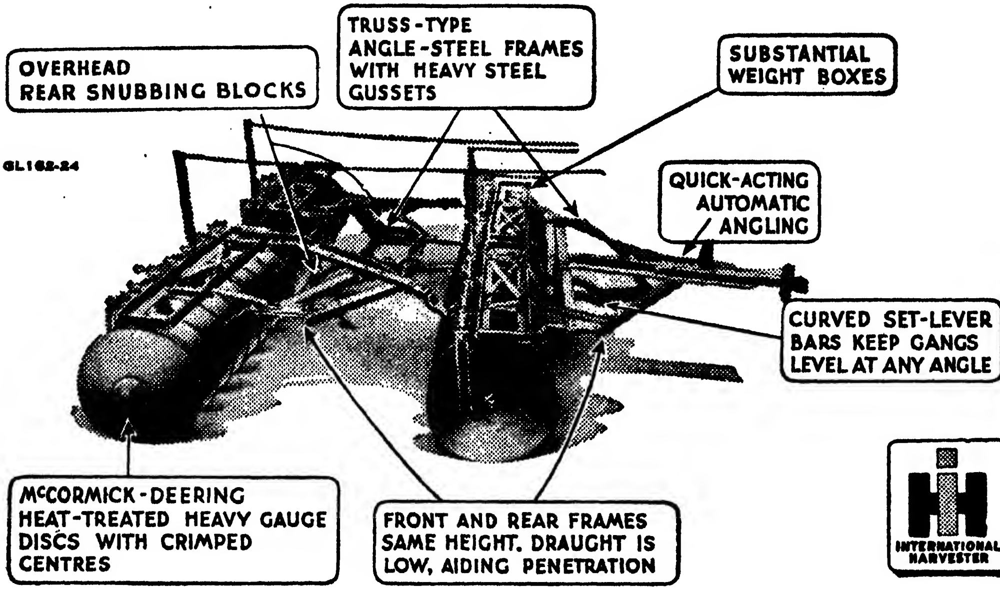
2. This deficiency can be corrected by the use of iron salts in certain ways, namely, crow-bar hole plugs and solid injections.

3. The control is more efficient under Murrumbidgee Irrigation Area conditions, when a long, comparatively thin column of iron sulphate spans the depth of the root zone, and so comes in contact with a greater proportion of the roots.

Acknowledgment.

Acknowledgment is made of the help given the writer by officers of the Biological Branch in providing solutions for injection, and also for help and advice given while the work was in progress.

McCORMICK-DEERING Tractor Disc Harrows



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[2] KEMP AND BEARE, "Lime-induced Chlorosis," *S. A. Agr. Jrnl., July,* 1945, *p.* 526.

[3] BATJER AND LUCE, *Better Farming,* March, 1947.—U.S.A.

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[5] Imp. Bureau of Hort. and Plantation Crops. Tech. Comm. No. 10. "Plant Injection for Diagnostic and Curative Purposes."

Superficial Scald of Granny Smith Apples—*continued from page* 409.

as by the use of commercial oiled wraps throughout the case. Upon removal from the cool store, if the fruit is repacked, the oiled sheets should be retained in position.

One slight disadvantage of the oiled-sheet method is the increased tendency of the fruit, if packed bare, to bruise slightly. When packing apples bare in this way, no attempt should be made to attain the same degree of "bulge" as is usual with wrapped fruit—the pack must be relatively solid and no allowance made for paper padding.

Against this slight disadvantage of the oiled sheets, however, can be placed the advantages of cheapness and easier and quicker packing and repacking after cool storage.

Wrapping Alternate Layers in Oiled Wraps.

An alternative method, which also has much to recommend it when oiled wraps are short, is to wrap only alternative layers.

In practice, the bottom layer of fruit is wrapped, the second is packed bare, the third wrapped and so on—making sure that the top layer also is wrapped in the case of six-layer packs. This method has been found to give good commercial control of scald with fruit stored as late as November.

Both this and the oiled-sheet method have been developed as emergency measures owing to a shortage of oiled wraps. Although both are effective in the control of scald up to a point, and are slightly cheaper than full wrapping, they are not recommended for storage very late in the season.

Points to Remember.

Points to remember in scald control may be enumerated as follows:—

1. Pick Granny Smiths at the correct stage, i.e., when the dark green colour is changing to a lighter shade.

2. Common store, for no longer than two weeks at the most, Granny Smiths intended for long storage.

3. Wrap all fruit in oiled wraps prior to cool storing, and store at a temperature of 33 to 34 deg. Fahr.

4. Alternatively, if oiled wraps are in short supply, use the alternate-row method of wrapping, or oiled sheets.

5. For long storage—to the November-December period—store only good, sound fruit of medium to small sizes, from reasonably aged trees carrying good crops.

6. If any doubt exists as to the development of scald, allow the fruit to remain two or three days after removal from store, and then examine before marketing; that is give the retailer and consumer fair value for their money. Remember that superficial scald very often does not show at its worst until a few days after removal of the fruit from the cool store to ordinary atmospheric temperatures.

7. Finally, remember that the Granny Smith is too valuable a variety to take any avoidable risks of damaging its reputation as an excellent late-keeper.

GROWTH of linseed crops from all areas in New South Wales is reported to be satisfactory. About 8,000 acres have been planted in this State this year. In the Mudgee district, although sowings were late, germination was satisfactory and rapid growth of crops has been reported.—MARKETING DIVISION.

AGRICULTURAL HOLIDAY CAMPS

To Overcome Britain's Farm Labour Shortage.

FOOD PRODUCTION DRIVE.

THE greatest obstacle to meeting Britain's demand for greater production of foodstuffs is the shortage of farm labour. The shortage is just as acute in Britain as in the Dominions. Britain, however, is a step ahead of others in solving the problem.

In a recent letter to the New South Wales Minister for Agriculture (Hon. E. H. Graham, M.L.A.), the Agent-General for New South Wales gives details of a system of "holiday volunteer agricultural camps" conducted by the British Ministry of Agriculture—which aims at enrolling 200,000 people for seasonal work in 1948. Men and women from offices and factories are being invited to spend their holidays in these camps and thus "lend a hand in the greatest-ever agricultural production drive."

Some 120 camps have been established throughout the country—practically every County has one at least. They consist of converted mansions, huts and the like, and are located in congenial surroundings. They are generally arranged for both men and women, with comfortable huts for meals and facilities for recreation.

The rate of pay for farm work is 1s. 5d. per hour, except where piece rates apply, and the hours worked vary from thirty-six to forty per week. The shortest stay for which volunteers are accepted is one week. Practically all volunteers are required for hand work—hoeing, hay making, pea- and fruit-picking and picking-up potatoes—the latter, perhaps, the most important job of all. Extra help in the potato harvest, it is stated, "could mean the difference between plenty and rationing."

The inclusive charge for food and accommodation varies with the time of the year, being less in the less attractive times of the year.

An Appeal to Lend a Hand in Britain's Food Production Drive.

Poster issued by the British Ministry in connection with Volunteer Agricultural Holiday Camps.

Junior Farmers' School at Hawkesbury College.

THE third annual Junior Farmers' School of Instruction at Hawkesbury Agricultural College was officially opened by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), on 6th July.

These schools were inaugurated by Mr. Graham in 1946, and are intended to give Junior Farmers from New South Wales an opportunity of completing a short but intense course of study on various aspects of agricultural activity under expert tuition.

About sixty Junior Farmers were in attendance from all parts of the State and their enthusiasm was apparent to everyone present.

PLANT DISEASES

FROST INJURY OF WHEAT.

F. C. BUTLER, B.Sc. Agr., Assistant Plant Pathologist.

FROST injury is the commonest source of yield losses in wheat crops throughout New South Wales. Despite seasonal variations in the severity of attack, observations indicate that frost is responsible for more consistent annual losses than any disease of a parasitic nature.

During 1936-37, damage was so extensive in southern and central New South Wales that tens of thousands of acres originally intended for grain purposes were subsequently cut for hay. Two seasons later crop yields were lowered by an estimated average of 25 per cent. in both northern and southern sections of the wheat belt. In both the 1939-40 and 1946-47 seasons, yield losses resulting solely from frost injury were greater than the combined losses accruing from all other causes, whilst in 1945-46 losses varying from 20 to 60 per cent. were recorded in northern and central wheat growing areas.

Symptoms of Frost Injury.

Despite the consideration warranted by its economic importance many farmers are unable to recognise the various symptoms of frost injury, and frequently confuse them with those which result through infection with diseases such as take-all, foot rot, black chaff and false black chaff. Largely because of this confusion there is a tendency to underestimate the significance of frost and consequently, there is a general failure to adopt those control measures which would assist in reducing losses.

Frosts, if sufficiently severe, can cause injury to the wheat plant at any stage of its development from germination until the grain is in the late dough stage. Most damage occurs, however, at such critical periods of crop growth as the pre-heading and flowering stages. Moreover, any of the above-ground parts of the plant may suffer injury.

Fig. 1.—Frost Injury on Leaves.

Normal leaves on left. Frosted leaves on right, showing in-rolling of margins, accentuation of pointed appearance at tips and degree of distortion.

Fig. 2.—Frost Injury on Stems.

Normal stems on left. Frosted stems on right, showing browning, buckling, distortion and splitting and rupturing at stem joints.

Whilst the following symptoms are described as they apply specifically to the leaves, stems and heads of wheat plants, very similar conditions are to be found, for the most part, in frosted oat and barley plants.

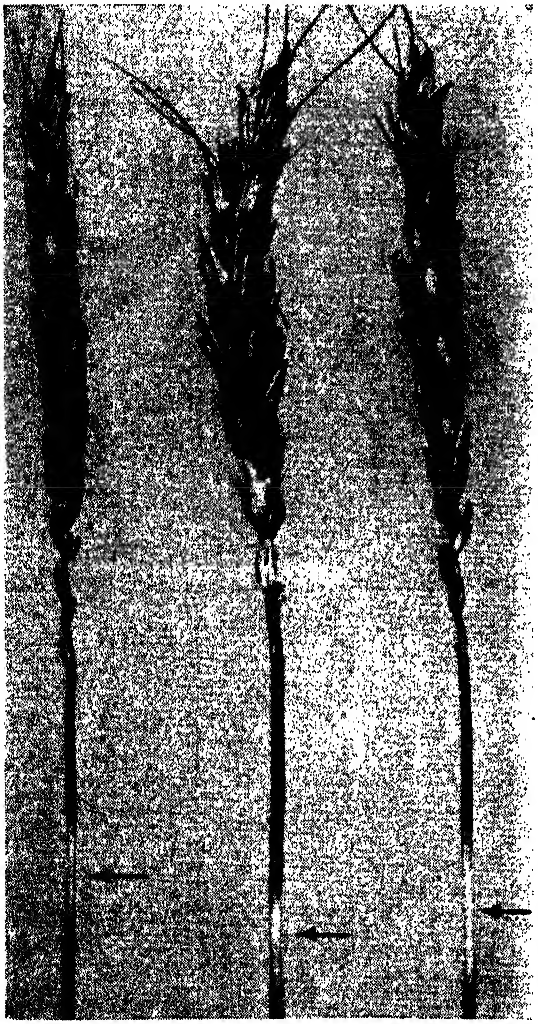


Fig. 3.—Ringbarking of Stems by Frosts.
Note white ring encircling stalk below the ear and unusual bareness at base of ear in each instance.

Leaf Symptoms.

The first indications of frost injury usually appear upon the flag of early-sown crops about mid-winter. In this early stage it is not unusual to find the entire leaf surface blighted, with damage occasionally extending to the young, growing point of the plant. More usually, however, the blighted area in the leaves extends back from the tips for about one half of the leaf's length. At first, affected leaves are a darker green and assume a somewhat flaccid appearance. Later they "brown off", become brittle and the affected crop takes on a parched appearance as though suffering from the combined effect of hot, drying winds and lack of soil moisture.

There is also a tendency for in-rolling of the leaf margins to occur from the undersurface. This is particularly noticeable in older leaves, which are also more prone to show a degree of distortion. As with young leaves, older leaves may show blighting over their entire surface, although it is more usual for tip-frosting to occur. The effect of in-rolling in tip-frosted leaves particularly, is to accentuate the brittle, pointed appearance of injured leaves (see Fig. 1).

In extreme cases, blighting may involve not only the entire leaf, but also the leaf sheath, even as far back as the node or joint from which it originated.

Stem Symptoms.

The symptoms of frost injury on the stems of affected plants are many and varied. It should be noted that certain of the stem-frosting symptoms described cannot be observed unless the surrounding leaf sheath is removed.

The most characteristic symptom is a browning of the lower joints and interjoints (see Fig. 2) although portions higher up on the plants may also show discolouration on occasions. On the outside surface the stem assumes a brown, silage-like colour. When split open, such stems show a dark reddish or chocolate-brown discolouration of the lining of the central stem cavity.

An even more striking symptom is the splitting and cracking which occurs at the two lower joints, particularly (see Fig. 2). This tendency to rupture at the stem joints is associated with the low elasticity of the tissues in these regions. This type of injury frequently accompanies stem browning and is often associated both with a swelling of the stem joints and a degree of stem buckling and distortion (see Fig. 2). A brownish discolouration similar to that on frosted stems, also frequently appears at the basal joints, although the upper nodes may be quite normal in colour. Occasionally, longitudinal splitting occurs in the stem, usually between the three lower-most joints (see Fig. 2).

Fig. 4.—"White Heads" due to Frost.

Normal heads on left. Frosted heads on right, showing typical white-head condition. Note how head development has been suppressed by frost killing of spikelets.

Although it is more usual for swelling to occur at the lower joints of stem-frosted plants, the stem itself may, on occasions, develop a swelling. When this occurs the affected tissues usually become soft and puffy or spongy.

Occasionally the tissue at the joints shrinks instead of swelling and rupturing. Shrinkage at the joints is accompanied by a drawn and taut appearance of the surrounding stem tissue.

Another common symptom is a "silvering" or blistering effect, particularly in the vicinity of the stem joints. This usually occurs on the upper side of the joints and is due to the formation of numerous small blisters in the surface tissues. The leaves and leaf sheaths may also show this condition.

Fig. 5.—Frost Damage at Various Stages of Head Maturity.

Normal heads on right. Frosted heads on left, showin damage in basal, central and tip regions.

In the pre-heading stage, frost damage may be detected by cutting across the main stalk in the vicinity of the still enclosed ear. Seen in cross section, a brown or whitish-brown discolouration of the internal tissues is a useful indicator of frost injury. The discolouration is even more obvious in frost-affected oat plants.

A condition commonly referred to as "ring barking" is yet another symptom of frost injury. This condition is characterised by a more or less conspicuous white ring, encircling the stem at a variable distance below the head, but above the point where the ear-bearing stalk emerges from the uppermost leaf sheath (see Fig. 3). An unusual bareness at the base of the ear frequently accompanies "ring barking."

Fig. 6.—Glume Fall due to Frost Injury.

Normal head on left. Frosted heads on right showing severe frosting in central regions. Frosted spikelets have dropped off to expose rachis.

Head Symptoms.

The most conspicuous symptoms of frosting occur on the heads, which may be affected even though still enclosed in the boot. More damage is caused, however, by unseasonably severe frosts in the spring, which blast the pollen before fertilization

occurs and so lead to a complete or partial failure of the head to set grain.

It should be noted that a wheat ear consists of two rows of spikelets, each of which contains from two to five flowers. As might be expected, flowering does not occur simultaneously in every spikelet on an ear.

Fig. 7.—Unusual Frost Damage to Heads.
Normal head on left. Frosted heads on right showing spikelet development in isolated areas.

Moreover, susceptibility to frost injury also varies, according to the stage of maturity of the spikelets. In these facts lies the explanation for the occurrence of partially filled heads—heads which may be tip-frosted or show injured spikelets at the base or at the centre of the ear, according to the stage of maturity in these particular regions of the ear when frosted.

Common symptoms of frost injury to the head include:

1. A blighting of the entire head causing a white, bleached condition commonly referred to as white heads (see Fig. 4). It should not be confused with a somewhat similar condition, also called white heads, which is caused by the fungal disease known as take-all. Frost killing of the entire head may occur either before or after the ear has emerged from the boot.

2. Partial head frosting (see Fig. 5) which is perhaps more usual than the complete head condition referred to above. Depending upon the severity of frost attack and the stage of maturity of the spikelets when frosted, the tip, central or basal portions of the ear may be blighted and shrivelled. Later these frosted spikelets may drop off, leaving only the bare rachis in frosted regions of the ear (see Fig. 6).

In some cases frosted spikelets are neither seriously bleached nor malformed and, apart from a partial failure to set grain, appear almost normal.

Of the three types of partial head frosting mentioned, tip-blighting is perhaps the commonest. A somewhat similar condition may be caused by hot drying winds. Occasionally heads showing unaffected spikelets in the centre of the ear, surrounded by tip- and basal-frosted spikelets are found. Even less common are heads with frosted spikelets distributed at random throughout the length of the ear (see Fig. 7).

3. A failure of the lower spikelets to develop, resulting in an unusual bareness at the base of the ear (see Fig. 3). However, this type of injury may also be indicative of drought conditions.

4. A wide open appearance of the glumes (see Fig. 8). Heads showing this condition suffered frost injury whilst the glumes were open at the flowering stage.

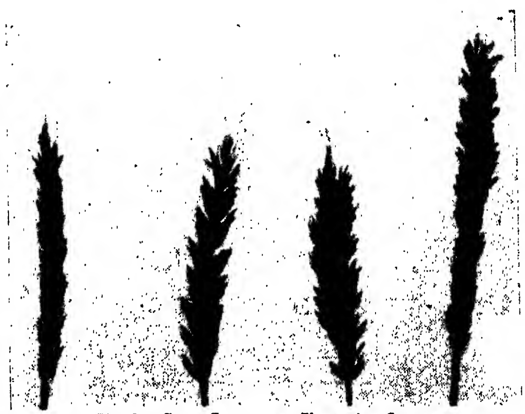


Fig. 8.—Frost Damage at Flowering Stage.
Normal head on left. Frosted heads on right showing wide open appearance of glumes. Note that head on extreme right has been frosted to approximately half its length, and basal spikelets are normal.

5. A complete or partial failure of the grain to develop, and resultant lightness and emptiness of the heads when handled. This results when frost injury as described in symptoms 1 and 2 above, destroys the

(*Continued on page* 426.)

INSECT PESTS.

Notes contributed by the Entomological branch.

BEAN FLY CONTROL.

P. C. HELY, B.Sc.Agr., H.D.A., Entomologist.

EXPERIMENTAL findings reported in 1947* indicated that routine spraying of autumn bean crops with D.D.T. sprays offered certain advantages for control of bean fly (*Agromyza phaseoli*) over the standard nicotine sulphate–white oil treatment.

It was also forecast at the time that spraying at weekly intervals, instead of the usual three- or four-day periods, would probably be satisfactory.

In a subsequent experiment this proved to be the case.

Details of Experiment.

The experiment was commenced at Mr. W. Rogers property, East Gosford, on 28th February, 1947, on a crop of Hawkesbury Wonder beans and was designed to compare different D.D.T. schedules with the standard nicotine sulphate-oil programme.

Bean fly infestation on self-sown beans, at the time of commencement of the experiment, was very heavy, and plants 6 inches high, in land adjacent to the experiment plots, were starting to topple over as a result of the heavy maggot infestation in the stems.

Six treatments were replicated four times, each in rows 99 yards long, and treatments were commenced on the third day after the plants commenced to appear above ground. On the day prior to commencing the experiment the whole bed had been lightly sprayed with D.D.T. at 0.075 per cent.

The following treatments were tested:

(A) D.D.T. emulsion, 0.05 per cent.—weekly application.

(B) D.D.T. emulsion, 0.05 per cent.—twice weekly application.

(C) Nicotine sulphate 1 oz., white oil 6 oz., water 4 gallons—twice weekly application.

(D) 2 per cent. D.D.T. dust—twice weekly application.

(E) D.D.T. emulsion, 0.1 per cent.—weekly application.

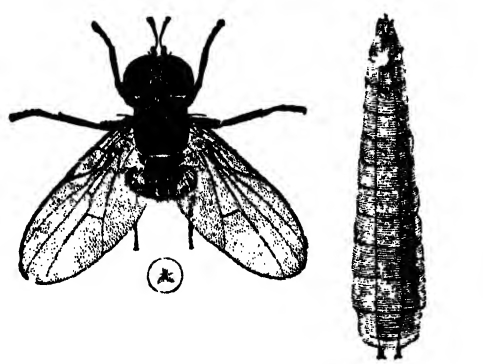
(F) Water dispersible D.D.T. powder 0.05 per cent., D.D.T.—twice weekly application.

A single row through the centre of the bed was allowed to remain without treatment as a check on normal plant and insect pest development.

Treatments were continued until just prior to blossoming, the final applications being made on 26th March. In all, seven applications were made to the twice weekly treated plots, and four to those receiving weekly treatment.

Observations on Maggot Development.

The following observations were made on the extent of maggot development in



Bean Fly Adult and Larva.

*Hely, P. C., *Agr. Gazette of N.S.W.*, 58: 2: 85–87.

the stems of representative plants throughout the plots at blossoming.

(A).—Stems and top branches almost completely free of maggot injury. Occasional larval mines were seen.

(B).—No maggot injury.

(C).—From light to moderate maggot injury in stems of plants.

(D).—Some light to moderate maggot injury in stems and top branches.

(E).—No maggot injury.

(F).—Some little maggot development occurred in stems and top branches.

Check row (untreated).—Maggot injury very evident in stems and top branches throughout. Plants at this stage were commencing to fall over and were thinned out in the foliage. Good cultural methods and hilling had, however, enabled these plants to set a fair crop of beans.

Yields Compared.

Picking commenced on 13th April; three pickings were made, the beans from each plot being separately weighed each time. The mean yields of green beans per plot in pounds are shown below.*

A.	74.25 lb.
B.	74.25 lb.
C.	53 lb.
D.	66.25 lb.
E.	67.5 lb.
F.	65.5 lb.

Conclusions.

Whilst no statistically significant yield differences were shown between bean plots treated with different D.D.T. spray and dust programmes, or with the standard nicotine—white oil treatment, there was definite evidence of better control of bean fly in those plants treated with D.D.T. sprays.

*These yields analysed statistically by Mr. F. C. McCleery, Biometrician of the Department, were found to be non significant.

There was little to choose between treatments involving the application of D.D.T. emulsion at 0.1 per cent. and at 0.05 per cent. D.D.T., whilst weekly spraying was just as effective with these materials as was twice weekly application. Emulsion sprays of D.D.T. appeared somewhat better than water dispersible powder sprays at similar concentrations.

Dusts containing 2 per cent. D.D.T. were inferior to sprays, though there was some controlling effect evident with these materials.

It is of some interest to record that foliage infection by *Bacterium syringae,* identified by Mr. T. B. Kiely, Plant Pathologist, was consistently in evidence in all plots sprayed with nicotine-oil spray, though only occasional infections were seen in other treatment plots.

No appreciable infestation by red spider (*Tetranychus urticae*) occurred in any of the plots.

Recommendations.

Summer and autumn bean plantings, in districts susceptible to bean fly infestation, should be sprayed with D.D.T. emulsion sprays diluted to contain approximately 0.05 per cent. D.D.T. A convenient and practical mixture may be made by diluting 2 oz. of 20 per cent. D.D.T. emulsion in 4 gallons of water. Spraying should commence on the third day after the plants appear above ground and subsequent sprays at weekly intervals should be made, continuing until just before blossoming. If necessary such sprays may include lime-sulphur at 1:100 if red spider is in evidence, but spraying for control of this pest must be done in such a manner as to wet the undersurfaces of the leaves.

If dusting for red spider control is the preferred method, a combination of sulphur and D.D.T. dust would have some value also for bean fly control. Such a dust should include 2 per cent. D.D.T., 50 per cent. sulphur and 48 per cent. kaolin.

CONTROL OF TOMATO PESTS.

W. L. Morgan, B.Sc.Agr., Entomologist.

IN recent years pest control measures for tomatoes have been simplified and improved by the introduction of D.D.T., and the older insecticides lead arsenate and nicotine sulphate, which previously were used extensively, are no longer required in tomato spraying and dusting programmes in New South Wales.

Sulphur sprays or dusts are still necessary for tomato mite control, and Paris green is useful for preparing poison bran baits for cutworms. The other pests of tomatoes are best controlled with D.D.T. These include fruit caterpillars, stem caterpillar, green aphids, jassids, green vegetable bug, vegetable weevil and black beetle.

Insect pest damage in tomatoes varies greatly with locality and seasonal conditions, and a programme to cover all areas and sets of circumstances cannot be set down; but any programme should always include the use of sulphur for mite control, and D.D.T. for other pests. Careful spraying of the undersurfaces of leaves with D.D.T. emulsion provides a measure of control for tomato mite, but in commercial practice, sulphur sprays or dusts should be used to control this pest. D.D.T. and sulphur are compatible and may be mixed and applied together either in sprays or dusts.

Use of D.D.T.

For spraying purposes, emulsions of D.D.T. are preferred to the dispersible powders, mainly because they appear to possess better contact action against insects. For the routine spraying of tomatoes every seven to ten days, a 0.05 per cent. D.D.T. spray will be suitable for most conditions. To prepare 40 gallons of 0.05 per cent. D.D.T. spray, 16 fluid ounces of a 20 per cent. emulsion or approximately 13 fluid ounces of a 25 per cent. emulsion are required. More concentrated (0.1 per cent.) sprays containing double these amounts of emulsion per 40 gallons are recommended for green vegetable bug and vegetable weevil, and for jetting into the soil around the base of plants to control black beetle.

D.D.T. dusts for tomatoes generally are of 1 per cent. strength; 2 per cent. dusts may injure young plants.

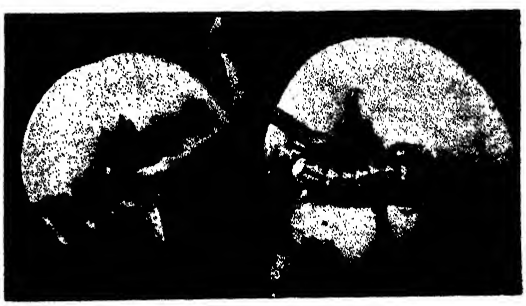
Sulphur.

Colloidal sulphur (1 lb. to 40 gal.), dispersible sulphur (1 lb. to 40 gal.), wettable sulphur (3 lb. to 40 gal.), or lime-sulphur (½ gal. to 40 gal.) may be used for spraying tomatoes for the control of mite. D.D.T. emulsion may be mixed with these different forms of sulphur. Lime-sulphur should not be mixed with sprays containing copper (used for disease control), but colloidal sulphur, dispersible sulphur or wettable sulphur may be used in such sprays. Where dispersible or wettable sulphur is used, efficient agitation of the spray is necessary.

In dusting for the control of tomato mite, sulphur is generally mixed with kaolin or hydrated lime to improve flow and secure good dispersion of the sulphur particles. Mixtures containing 40 per cent. to 60 per cent. sulphur are satisfactory in this respect, though some growers use a mixture of 90 per cent. sulphur and 10 per cent. kaolin.

General Purpose Dusts.

Dust mixtures containing sulphur, D.D.T. and copper are used for the control of tomato pests and diseases. A mixture commonly used contains 40 per cent. sulphur, 8 per cent. copper oxychloride or copper carbonate and 1 per cent. D.D.T. For disease control the copper oxychloride or copper carbonate content sometimes is increased to 15 per cent. or 20 per cent. Under dry inland conditions dusts often



Tomatoes attacked by Fruit Caterpillar.

contain sulphur and D.D.T. without a copper fungicide.

General Purpose Sprays.

A spray formula for pest and disease control which is in general use in coastal tomato growing districts is—

D.D.T. emulsion (20 per cent)	16 fluid oz.
Colloidal sulphur	1 lb.
Bordeaux mixture (1:1:40 or 1:1:20)	40 gallons.

In this formula wettable sulphur 3 lb., or dispersible sulphur 1 lb., may be used instead of colloidal sulphur 1 lb. In areas where blights are not difficult to control, copper oxychloride (1-2 lb. to 40 gal.) often replaces Bordeaux mixture.

General Recommendations.

Tomatoes in all districts should receive regular treatment with sprays or dusts containing sulphur to control tomato mite. For most conditions, crops should be treated every three weeks, and seed-beds should be treated about ten days before the plants are transplanted.

To control *fruit caterpillars,* in spring and autumn crops on the coast, spray or dust with D.D.T. every seven to ten days during the fruit setting period. Mid-season coastal crops, and inland crops, generally require less frequent treatment, and four or five applications of D.D.T. at fortnightly intervals, usually, will ensure clean fruit. However, showery weather during the summer and autumn may result in severe infestation of fruit caterpillars, and treatment every seven to ten days may become necessary for a period of a month or six weeks.

Stem caterpillar occurs in some Sydney and Newcastle areas. For its control, seed-beds should be treated every seven to ten days, and treatment should be continued for two months after planting out.

THE PINE APHID (*Cinara thujafolia*).

E. H. ZECK, Entomologist.

THESE aphids, which infest various species of cypress pines of the genera *Thuja, Callitris* and *Cupressus,* have been recorded developing in large numbers during the present season, and in one instance were reported to be causing a nuisance by crawling over furniture and articles in a dwelling where they had wandered from pines growing nearby.

They are usually most numerous during the cooler months of the year, and although the twigs and smaller branches of the trees may be thickly covered with them, they are not readily noticeable, as their colouration resembles that of the bark.

These aphids excrete large quantities of honeydew, and where this falls on the foliage and branches beneath, sooty mould develops and the trees become blackened. The foliage becomes yellow as the aphids suck up the sap and the ends of the branchlets may wilt.

This aphid, which was originally described from South Africa, where it was found infesting *Thuja orientalis,* also occurs in Formosa, Japan, Korea and Java, as well as Australia. The first record of its occurrence in New South Wales appears to have been made in August, 1921, when specimens were collected in the cypress pine forests near Narrabri. It is widely distributed throughout the State, and is common in the Sydney district.

The adult aphids, which may be either winged or wingless, are large, broad-bodied insects. They are of a general dull brown colour, with orange-brown or greenish areas, and are somewhat variable in size. The winged forms may measure one-fifth of an inch in length, from the head to the end of

(*Continued on page 426.*)

SKIN BLEMISH OF NECTARINES

Caused by Plague Thrips.

S. L. ALLMAN, M.Sc., B.Sc. Agr., Senior Entomologist.

EXPERIMENTS conducted last season showed that the blemish frequently seen on Goldmine nectarines grown in the Metropolitan Area is caused by young plague thrips *(Thrips imaginis)* feeding on the developing fruit during the first two or three weeks after pollination.

It was shown that the loss may be avoided by a single spraying.

Serious widespread infestations of plague thrips (*Thrips imaginis*) have been recorded in this State over the past forty years, the major plagues occurring in 1914, 1926 and 1931. Equally serious but localised infestations have since been recorded in a number of fruitgrowing districts. The species concerned is essentially a blossom thrips, and in a plague year flowers of every description, including those of grasses and plantains, are infested.

Previous investigations have mainly been concerned with the faulty setting of apple crops, and it was generally considered that the earlier blossoming stone fruits escaped injury. The 1931 plague, however, commenced with the infestation and damage to the opening blossom buds of peaches, prunes and apricots, and this blossom injury, together with the deposition of thrips eggs within the flower stems, was considered to be responsible for much of the early blossom fall and consequent crop failure of stone fruit.

The spring increase of the thrips population is made possible by the abundance of many different blossoms from mid-August onwards, and the widely distributed introduced Capeweed (*Cryptostemma calendulaceum*) contributes greatly to this increase.

It has been more or less accepted that the presence of twenty or more thrips per apple blossom represents a dangerous population and that blossom injury and erratic setting will follow an infestation of this order.

The plague thrips, in association with the black thrips (*Heliothrips haemorrhoidalis*), has been recorded breeding on canning peaches in the Murrumbidgee Irrigation Area, but owing to the protection afforded by the fuzz or hairy covering on the skins of young peaches, damage is usually limited to the stunting and curling of the young leaves. A malformation of Granny Smith apples, known as "dimpling," is also thought to result from feeding by young thrips on the newly-set fruit.

Fig. 1.—Young Peaches at Shuck-fall Stage.
Note split shucks, at right ready to fall from fruits.
[After W. W. Chase.

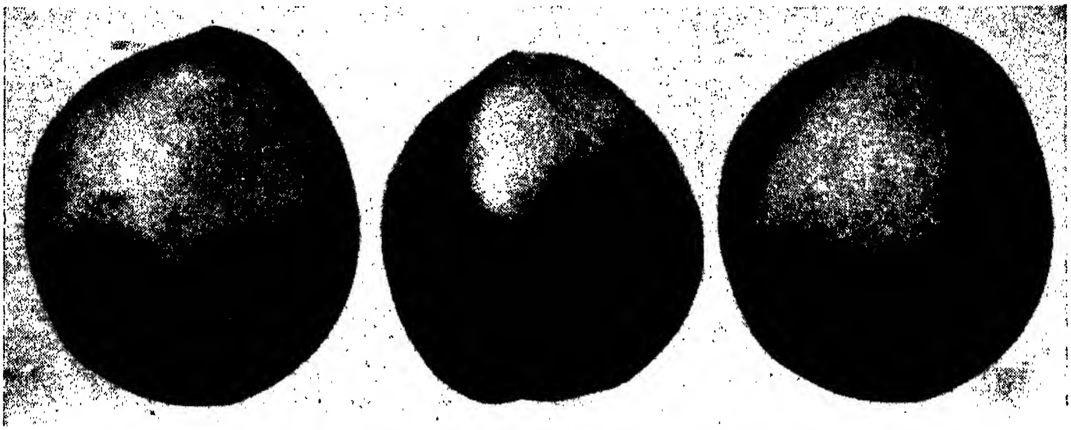


Fig. 2.—Typical Goldmine Nectarines of the Coastal Area.
Note flattened conical form, with pointed apex.
[Photo—J. R. Rengger.

Nectarine Skin Blemishes.

During the 1946 season specimens of Goldmine nectarines grown in the metropolitan area were submitted for examination. These nectarines were russetted in varying degree from the light scurfing often associated with wind blemish, to a more defined and patterned network involving, in many cases, half the skin surface. Malformed, deeply-grooved or even cracked nectarines were also common, the degree of injury in these instances being similar to that caused by an insect such as the green tree-hopper (*Caecidia strenua*).

The typical Goldmine nectarine of the coastal area is a flattened conical fruit with a pointed apex. Nectarines with any pronounced blemishing do not exhibit this typical shape, become more spherical in form and have the apex flattened.

In some instances total crop losses were reported and an inspection of nectarines displayed for sale indicated that a very high percentage of fruit was blemished to some degree.

The nature of the blemish suggested that thrips were responsible for the condition, and that the injury had occurred when the fruit was small, being due to the feeding of colonies of young thrips developing from the initial blossom infestation.

The nectarine, like all stone fruits, is developed from the growing ovary and the more obvious parts of the flower, with the exception of the already fallen petals, are retained for some weeks. The rapidly-growing fruit splits the drying floral tube or shuck, which is shed when the nectarine is ¼ to ½ inch in diameter. This shedding is commonly referred to as "shuckfall." This method of development and the retention of the shuck are important in this connection as young thrips shelter and feed for several weeks under the natural cover so afforded.

Nectarines are smooth-skinned fruits and obviously are subject to skin blemishes. As the thrips feeding-injury occurs during the two or three weeks after pollination, when the young fruit is growing rapidly, any blemish at this stage naturally becomes more pronounced as growth proceeds.

Observations during Blossoming.

During the third week of September, 1947, when the nectarines were in full bloom, several inspections of the blossoms were made. The thrips population was found to be extremely light, averaging less than one adult per blossom. Such a population would normally be dismissed as of no consequence, and control measures would not have been thought necessary.

An inspection at almost complete petal-fall (29th September) indicated that young thrips had commenced to appear and an average of two were found in each blossom. The adult population still remained at less than one per blossom, but even at this low density it was not difficult to find three or four thrips eggs per sepal. The young nectarines were obviously developing at this

stage and some were sufficiently advanced to fill the floral cups.

Thrips Control Spray Experiment.

A 0.1 per cent. D.D.T.—solvent naphtha emulsion had previously been found to be very effective in controlling several other species of thrips. It was decided to apply this spray to each alternate tree in a block of seventy-five Goldmine nectarines at West Pennant Hills. A single application only was made, on 29th September, at the time when the majority of the petals had fallen and young thrips were commencing to appear.

Spraying Results.

Examination of the trees four days after spraying clearly indicated that the thrips population had been very substantially reduced on the sprayed trees. Samples of fifty young fruits were examined from each of ten sprayed and ten unsprayed trees, and the number infested by thrips recorded.

Only twelve fruits of the 500 examined from the sprayed trees were infested, whereas 418 were infested in the corresponding sample from the unsprayed trees. Some of the most advanced fruits at this stage were shedding their shucks, which were drying out perceptibly, but shedding was not completed for approximately a further three weeks.

At the time of this first fruit examination, the majority of the fruits from the unsprayed trees were obviously marked. By the end of October, when the nectarines had developed up to 1 inch in diameter, the fruit from the sprayed trees was virtually free of blemishes, whereas unblemished fruits were rare on the unsprayed trees.

During thinning, the results of the spraying became even more obvious. On sprayed trees thinning proceeded by rule of thumb and excess fruit was removed without inspection. It was necessary, however, on the unsprayed trees to inspect each fruit individually, in order to retain those showing the least blemish. It was found that the time required for thinning unsprayed trees

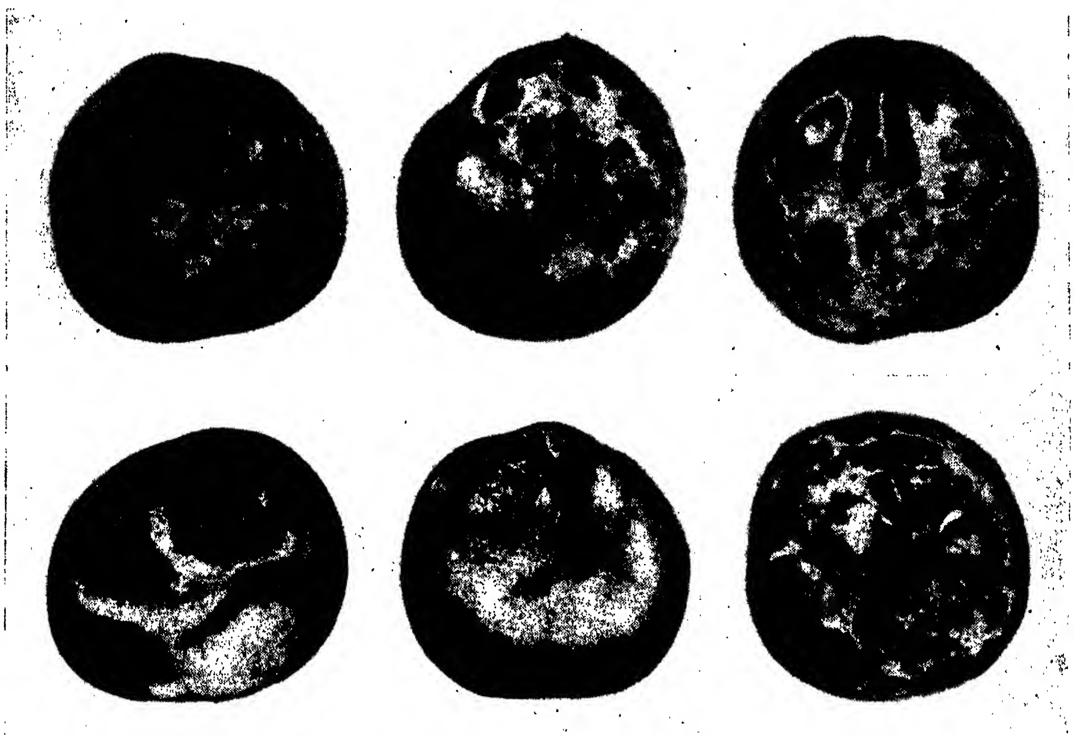


Fig. 3.—Blemished and Malformed Nectarines.

Top Row.—Lateral view; note extensive skin blemishes and apical constriction of centre fruit.

Bottom Row.—Apical View; note grooving and malformation.

[*Photo—J. R. Rengger.*

was at least half as much again as for the sprayed trees.

Final examination—at harvesting in mid-January—showed that 5 per cent. of the fruit from sprayed trees had relatively minor blemishes, while 63 per cent. of the fruit from unsprayed trees had blemishes the majority of which would result in lowered grading or unsaleable fruit.

Summary.

The blemish frequently observed on Goldmine nectarines grown in the metropolitan area is caused by colonies of young plague thrips feeding beneath the shucks on the developing fruits. Serious losses can be sustained from an initial population of less than one adult thrips per blossom.

A single spraying with 0.1 per cent. D.D.T. emulsion, applied when the majority of the petals have fallen, will eliminate this loss.

Acknowledgment.

The writer is indebted to Mr. E. C. Levitt, Fruit Officer, who originally drew attention to this problem, and to Mr. W. Mills, Fruit Inspector, who assisted in the investigation. Mr. R. Butler, orchardist, of West Pennant Hills, on whose property the test was carried out, also helped materially and made a number of pertinent observations.

Plant Diseases—*continued from page* 418.

male and/or female parts of the wheat flowers.

6. A transparency of the ears which is particularly noticeable when head-frosted crops are viewed into the sun.

7. Shrivelling and cracking of the grain. Despite a very general impression to the contrary, frost injury may occur to the grains in the ear. Grain in the milk stage is more susceptible than grain at a later stage of development, but injury may occur so long as there is an appreciable amount of moisture present.

Grain frosted in the milk stage tends to shrivel. The effect of frost on more mature grain is to crack the seed coat, which, as a result, often assumes a rough, bran-like appearance. In both instances injury is more likely to occur when the grain has been moistened by light rain shortly previous to frosting.

(To be concluded.)

Insect Pests—*continued from page* 422.

the wings. The wingless forms are broader towards the end of the abdomen, and may have several darker, longitudinal bands extending backwards from the head. These may be bordered by lighter bands.

The beak is long and tapers to a sharp, lance-like point.

The young forms are paler and yellowish in colour, and in these the beak may extend backwards beyond the end of the abdomen when at rest.

All forms have very hairy bodies and the cornicles (or so-called siphons) are flattened conical structures. The tail is broad and rounded.

Control.

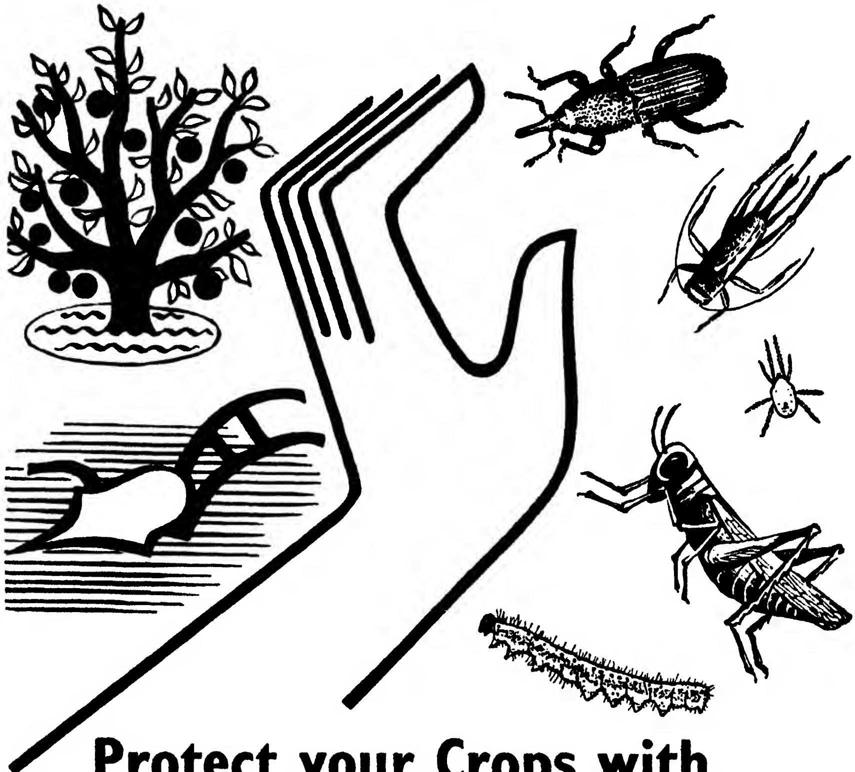
Control may be obtained by spraying with a nicotine and oil solution diluted at the rate of:—

Nicotine sulphate	1 fluid oz.
White oil emulsion	8 fluid oz.
Water	4 gallons.

Another spray that may be used consists of:—

D.D.T. emulsion (20 per cent.)	3 fluid oz.
Water	4 gallons.

Where the infestation is severe, a second application of spray, about seven days after the first, may be necessary.



QUICK FREEZING OF FRUITS AND VEGETABLES
In U.S.A. and Canada.

(*Continued from page* 313.)

S. M. SYKES, B.Sc.Agr., Fruit Officer (Research).*

THIS is the third section of this article, the previous instalments having appeared in April and June issues. In them the author dealt respectively with recent technical advances in the process and with American methods of handling fruit by the quick-freezing process.

The Freezing of Vegetables.

Probably the greatest advances in the freezing of foods in recent years have been in the treatment of vegetables. To-day peas are frozen in large quantities for household and institutional consumption. Many other vegetables are now being frozen in quantity and the output is rapidly increasing. There are still a great many technical problems to be solved but, except for the recent lapse, which was due to abnormal market conditions, the quality of most vegetables has improved from year to year.

Peas are by far the most important frozen vegetable. Frozen peas are usually preferred to canned peas, because of their natural flavour and intense green colour. Fancy quality frozen peas are normally more palatable and acceptable than good quality fresh market peas. This is due to the fact that the frozen peas are harvested closer to the time of optimum maturity, and if promptly processed and frozen will retain this full flavour and freshness. On the other hand, peas marketed in the fresh condition have every chance to deteriorate between harvesting and consumption. The ease of preparation for cooking is another factor which has contributed to the popularity of frozen peas.

Other vegetables which are frozen in large quantities are spinach, snap beans, lima beans, sweet corn, and asparagus. The winter vegetables—broccoli, Brussells sprouts, and cauliflower—are produced in some of the warmer areas and the output of these vegetables is rapidly growing.

Most vegetables that are consumed in the cooked state can be successfully frozen. At present, those vegetables which are normally eaten uncooked in salads, such as tomatoes, lettuce and cucumbers, do not give satisfactory products, on account of the loss of crisp texture during freezing and thawing out.

The method of processing varies with the particular vegetable but, in general, it involves washing, blanching, cooling, inspection and packaging. Many different techniques are used for freezing. Some vegetables such as peas or lima beans are frequently frozen loose on trays or moving belts. Many consumers prefer peas frozen in the loose rather than in the solid block form.

The quality of the vegetable in the field, at the time of harvest and throughout processing until it is actually frozen, is of great importance. In setting up a freezing operation, the selection of the proper growing area and the best varieties are aspects which should be treated with special attention. Harvesting of vegetables at optimum maturity is one of the main factors which will ensure high quality in the final frozen article and the frozen food operator is well advised to assign adequate field staff to this part of the operations. Not only should there be suitably trained men to determine when the raw material is ready for freezing, but there should also be supervising officers in the field to ensure that the harvesting

* Mr. Sykes, recently returned from an investigation of quick-freezing methods in U.S.A. and Canada.

operations are correctly carried out. High garden-fresh quality must be characteristic of frozen foods if they are to retain their identity. The only way to ensure it is for the operator to look upon the field work as part of the processing line—probably the most important part. Good raw material can be ruined in the processing plant, but bad raw material cannot be improved.

A Package of Quick Frozen Peas.

The facilities for rapid transport from field to plant, for pre-cooling, and for holding under cold storage when necessary, are all important considerations in the production of good frozen vegetables.

The processing of vegetables in the plant should be as rapid as possible. The problem of bacterial spoilage in vegetables for freezing, particularly in peas and lima beans, makes it essential to have the raw material passing through the plant to the freezer as rapidly as possible. The importance of plant sanitation in keeping down bacterial counts cannot be over-emphasized. Once the product is cooled to freezing point the danger of rapid deterioration is past.

It is recommended that frozen vegetables be stored at 0 deg. Fahr. Because of the danger of bacterial growth and consequent spoilage, it is specially necessary to maintain correct temperatures during storage, transport and retailing. Many examples of spoilage have been traced to faulty temperature control.

PREPARATION OF VEGETABLES FOR FREEZING.

Peas.

When peas are ready for harvesting, the vines are cut at ground level with a mechanical "swather" and the vines loaded on to open trucks which take them to the viners. In the vining operation the individual peas are separated from the pods and vines and are collected (about 4 inches deep) in lug boxes.

On arrival at the plant the boxes of shelled peas are stacked on the receiving platform. Here, they are weighed and checked for maturity, amount of trash and general quality.

The first stage in the processing line is the cleaning of the peas in a dry-cleaning mill. This machine, constructed chiefly of wood, eliminates much of the larger foreign materials by means of vibrating screens and blowers. From the dry-cleaning mill, the peas pass into the washer which removes most of the smaller vine trash, weed seeds, pieces of pod, stones and dust.

After washing, the peas are scalded or "blanched" in either hot water or steam. Most plants prefer hot water for peas, since it requires less steam, gives a more uniform blanch and also gives a more complete washing. Peas blanched in hot water at about 212 deg. Fahr. require 50 to 60 seconds. The purpose of blanching is to inactivate substances called "enzymes" which are present in living plant tissue and which will cause undesirable changes in the product if not destroyed. The hot water blancher is a large cylindrical tank of boiling water through which the peas are conveyed by a slow-moving worm gear.

After emerging from the blancher, the peas are cooled in flumes of cold water. From the end of the cooling flumes the peas pass to the quality separator.

The principle involved in the "quality grading" or "quality separation" of peas is based on the fact that peas become denser as they mature. If peas of mixed maturity are passed into a stream of brine of suitable density, a separation can be made between the less mature peas, which float, and the more mature peas, which sink.

After they emerge from the quality separator, the two grades of peas are washed in flumes and distributed over separate inspection belts where "splits," "skins," off-coloured peas and foreign material are removed.

Where a canning operation is carried on conjointly with freezing, the second-grade peas may be canned and the first-grade ones frozen. The usual practice is to freeze both grades and label the packs accordingly.

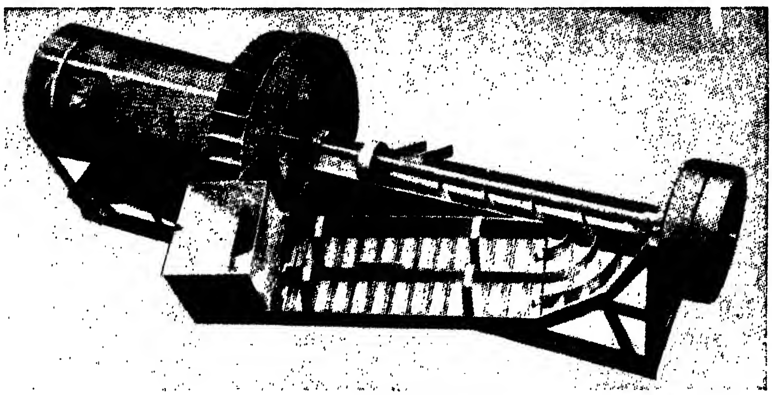
If the peas are packaged before freezing, then they are filled into containers by means of a suitable filling machine. The package weight is then checked, a waxed over-wrap is applied and the packages are passed into the freezing unit.

When the peas are to be loose-frozen before packaging, they are fed directly through the freezing unit on a moving belt, or alternatively, they may be spread on trays which are delivered to the freezer on trucks.

Beans (Green and Wax).

After harvesting, beans are transported to the plant in open-mesh bags or wooden hampers. If they must be held for periods over 24 hours, they should be placed in a room at 40 deg. Fahr. and spread out to prevent sweating.

The beans are usually first put through a snipper. This machine consists of a revolving drum with special perforations through which the ends of the beans project. Stationary knives are in contact with the outside of the drum and snip off the projecting ends of the beans.



Pea-washing Machine.
[*Courtesy of Food Machinery Corp.*

A short inspection belt follows the snipper. Diseased, damaged and any unsnipped beans are removed.

The next stage in the processing line is grading. The grading machine consists of a rotating drum with slots of different sizes. The beans fall through the slots according to their individual thickness. From the grader, the beans are discharged into bins.

According to the size of the beans, they are taken to the Urschel cutter, the French slicer, or, for the whole bean pack, direct to the blancher. Only the smaller, more tender

beans are used for the whole bean pack. Frequently, all of the beans up to a certain size are put through the cutter (1 inch cuts) and the larger ones are French sliced—in a lengthwise direction.

The beans are then blanched. Steam blanching is commonly used, the time varying from 2 to 4 minutes.

After blanching, the beans are cooled in water sprays or flumes and passed over inspection belts before packaging.

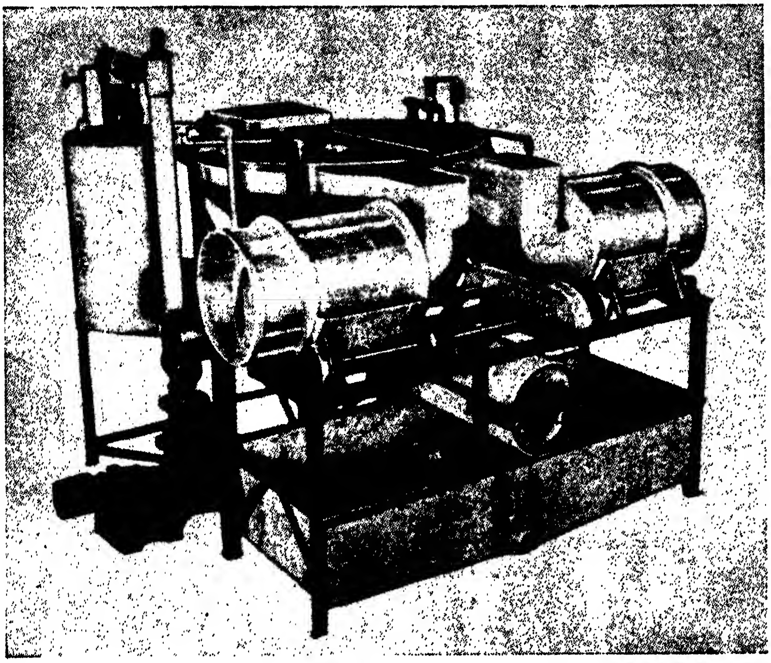
Cut beans can be packaged before or after freezing and mechanical fillers can be used in either case. French-style sliced beans must be hand-filled and, since they cannot be loose-frozen, they must be packaged before freezing.

Broccoli, Brussels Sprouts and Cauliflower.

The preparation technique is fairly similar for these three vegetables. They are referred to as the "winter" vegetables and are grown largely in California, Texas and to some extent, in the Pacific north-west. All three yield very attractive products on freezing if the growing and processing has been according to the best practice.

Broccoli is harvested by hand and brought to the plant in crates or hampers. Shoots with yellow blossoms should be discarded in the field. If the material cannot be processed immediately, it should be held at 35-40 deg. Fahr.

Before processing, the broccoli is sometimes given a spray of cool water. It is removed from the crates by hand, trimmed and placed on a moving belt (about 5 inches wide) with the heads all in one direction. A mechanised cutter, half-way along the line, cuts the stalks to the correct length of 5 inches.



The Lewis Quality Separator.

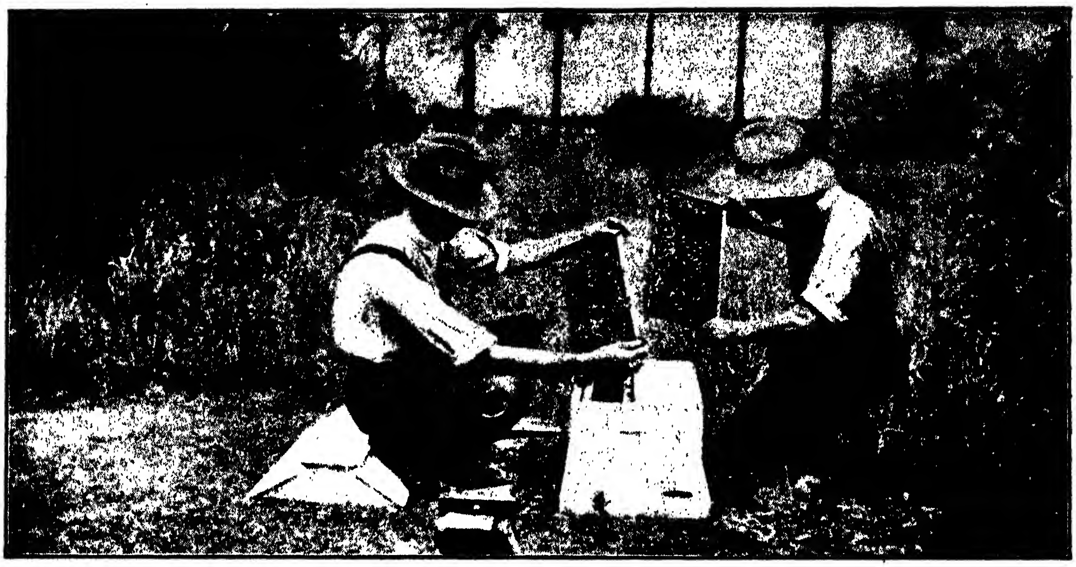
This machine separates peas into two maturity grades.

[*Courtesy of Food Machinery Corp.*

The stalks are then discharged into the washer. High pressure sprays carry them through the washer to a conveyor belt which leads to the steam blancher. The blanching time varies from 3 to 5 minutes.

After blanching, the heads are cooled under sprays, in a water bath or in flumes. They then move on to a sorting belt where any further undesirable heads are removed. Yellow blossoms, and also broken heads, are often detected after blanching.

The product is usually collected in metal pans and hand-packed into cartons. Alternatively, packaging may be combined with the final inspection and the good stalks packed directly from the belt.



Examining the Work of a Young Queen Bee.

APIARY NOTES.

PARALYSIS IN BEES.

SOME RECENT OBSERVATIONS.

W. A. GOODACRE, Special Livestock Officer (Apiculture).

PARALYSIS in bees is a persistent form of "dwindling" disease of adult bees, and mainly affects individual colonies. In this latter respect, and because of one or two slight variations in its symptoms, paralysis differs from other forms of dwindling troubles—such as spring dwindling, and the form which causes heavy mortality amongst adult bees from food troubles—which temporarily affect many colonies in the apiary.

The bees affected with paralysis are fairly young adults. In some cases the mortality, although rather consistent, is not heavy, and the affected colony may carry on successfully both in maintaining a good hive population and in production. In severe cases, however, the colony strength becomes depleted and masses of dead and dying bees can be observed about the hive entrance.

Typical Symptoms.

The symptoms of a genuine case of paralysis are as follows:—

(*a*) Dead and sick bees on the ground about the hive entrance;

(*b*) Abdomens of affected bees swollen as a result of dysentery;

(*c*) Wings of sick bees outstretched and trembling;

(*d*) Many affected bees have a dark and greasy appearance.

In severe cases, if the hive is inspected fairly early in the day, sick bees will be found inside the hive, particularly about the top bars of the frames.

The persistent nature of paralysis, its attack on individual colonies and the presence of bees with swollen abdomens and

trembling movements are helpful in a field diagnosis to separate the disease from other forms of dwindling.

May Be Caused By a Virus.

Paralysis may be caused by a virus, and some reference has been made to this aspect in overseas journals. If a virus—an organism so small that it cannot be seen under a microscope—is a factor causing paralysis, then it is strange that the disease is not transmitted to other colonies generally; it is only spread by the introduction of a queen from an affected hive. Even then symptoms only develop when the worker progeny of the queen begin to take an active part in the colony life. Interchange of brood and bees from affected hives to healthy ones rarely, if ever, transmits the disease.

The Nature of the Disease.

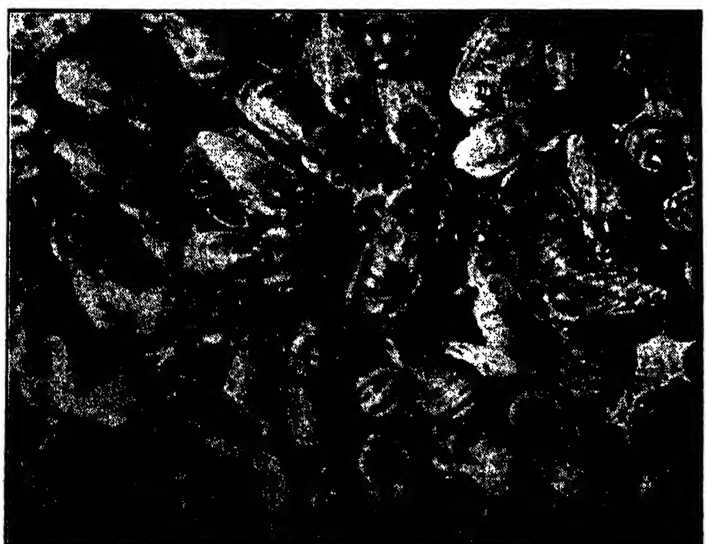
Some years ago, the Department carried out a series of experiments in connection with paralysis. Queen bees from a healthy colony and an affected one were exchanged. It was later observed that when the worker progeny of both queens superseded their predecessors in occupation of the hives, the previously affected colony became free of paralysis, and the previously healthy colony exhibited all symptoms of the disease.

Further experiments along similar lines gave ample proof that the queen bee is responsible for the development of paralysis. It was also considered, as a result of the experiments that the disease is to a large extent hereditary.

Recent Experiments.

To secure further evidence as to the hereditary nature of paralysis, the Department has, during the past four years, carried out a further series of experiments in bee-breeding work. For a commencement, a tested golden Italian queen from a colony persistently, but not heavily, affected with paralysis was secured. Four queen bees were bred during spring from this queen and introduced to progressive nucleus colonies of healthy bees.

During their first season the four young queens were most progressive in brood-rearing, and each of the colonies established an 8-frame full depth brood-chamber and a super—with no evidence of paralysis developing in the hive. In the second year, however, two of the colonies exhibited symptoms of paralysis during the late spring and a third one developed the disease later. The fourth hive remained free. During the third year the disease intensified in the three affected hives and they began to lose strength. Young, vigorous queen bees were introduced at this stage, and the colonies made a complete recovery when the new worker progeny took over control of the hives.



Queen Bee Surrounded by Attendants.

The original queen bee selected for the breeding experiments lived until the summer of her third year (it was in her second year of activity that the young queen bees were raised for the project). Symptoms of paralysis were persistent during each brood-rearing season in this hive, and occasionally heavy losses of adult bees were observed.

During an inspection of the hive in the final stage of her life, it was observed that she was very sick. The abdomen was greatly swollen and the old queen could scarcely hold on to the combs; no eggs had been laid for about a week.

At this time it was decided to submit the sick queen to the Department's Biologist for microscopical examination. The examination did not reveal the presence of *Nosema apis* or other disease of the adult bee, but there was evidence of dysentery which caused distention of the abdomen. Her digestive system was full of a clear, watery fluid, some of which was naturally discharged when the queen was being caged just prior to the examination.

RECORD HONEY-FLOW IN PROSPECT.

Problem of Hive Materials.

The honey-flow prospects for the coming season indicate a record production of honey; it is estimated that 12,000,000 lb., will be extracted.

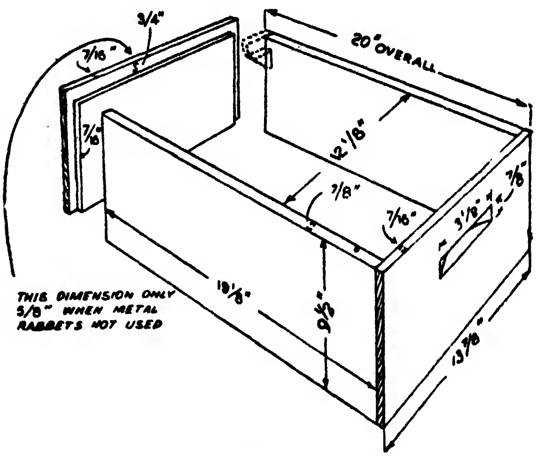
One of the difficulties facing beekeepers is the establishment of a reserve of hive material to provide for increase of colonies and for adequate super accomodation on established hives during honey-flows.

Sufficient supplies of factory-made hive bodies will not be available, and beekeepers will require to secure any supplies of useful timber and make hives at home. Where a small sawbench is available, the sketch of a hive body shown in the accompanying illustration will prove useful.

Although the presence of a virus was not determined, in the experiments it appears likely that a virus may cause the paralysis disease. If this is so, the experiments indicate that queen bees must have some hereditary susceptibility to the virus, which could be localised in the ovaries and transmitted through the eggs.

Restoration of Affected Colonies.

A very interesting observation was made later when a young queen was introduced to the original colony. This young queen was accepted, but only laid a few eggs and became sick with similar symptoms to those exhibited by the old queen. This was a most unusual occurrence, and it was considered that, with the colony suffering severely from paralysis at the time, many sick bees being inside the hive, the food given to the queen may have been contaminated and caused dysentery. The trouble was finally overcome by direct introduction of a comb of brood well covered with bees and a young vigorous queen in company.



Sketch of a Home-made Hive Body.

A beekeeper who has a small sawbench could make up bodies of this type from any suitable timber available.

Danger of Breeding from Affected Colonies.

The experiments illustrate the danger of breeding from colonies showing any symptoms of paralysis; also that the prompt replacement of the queen in an affected hive is the only satisfactory way of overcoming the disease. Stimulative feeding of warm sugar syrup for a few days prior to the introduction of a new queen will lift the "morale" of the colony—which is helpful when the mortality is on the heavy side.

A NEW POISON BAIT FOR BLACK BEETLE.

C. R. WALLACE, B.Sc.Agr., Entomologist.

IN the course of last season's investigations on the black beetle pest* a poison bait was developed which has given outstanding results. This bait is inexpensive and easily prepared, its only ingredients being broken maize grain and an insecticidal dust containing benzene hexachloride (gamma isomer).

Materials.—The attractive material consists of maize grain which has been broken mechanically in such a way that each grain has been reduced to about six to eight separate, coarse, angular fragments. The poison is a prepared dust containing 1.3 per cent. of the gamma isomer of benzene hexachloride. Dusts of this type are commercially obtainable at about 1s. 1d. per lb. Three pounds of dust are required for each hundredweight of broken grain.

Mixing.—The broken maize is spread out on a large sheet of paper and is evenly sprinkled with the insecticidal dust. The dusted maize is then poured into a drum, which is tilted and rotated until a thorough mixing of grain and insecticide is obtained.

Performance.—It has been demonstrated that this bait, when scattered on the surface of cultivated land during warmer months of the year, is highly attractive and also extremely deadly to the adults of black beetle. For instance, one grower who used this bait reported a kill of 438 beetles in 14 yards of furrow. The material is so attractive that many beetles are drawn to it even when it is scattered among young maize plants.

Recommendations for Use.

Black beetle attacks so many kinds of crops in such varied circumstances that no fixed procedure can be laid down to cover all contingencies. However, certain guiding principles can be stated as follows:—

1. Cultivated land found to be infested with beetles during the winter could be baited as soon as the beetles become active with the warm weather of spring. The aim of this spring baiting is to rid the land of its beetle population *before the crop is planted.* The bait should be broadcast, ½ bushel per acre being suggested as a tentative rate.

It is likely that even better results might be obtained by placing bait in the soil as well as at the surface. With ordinary equipment this could be done by baiting the land, harrowing or discing and then baiting again.

2. Migration by beetles crawling in from adjacent grassland—an important source of crop loss—can be prevented by the well-known practice of running a vertical-sided furrow between the cultivation and the nearest grassed land. The furrow should be deep and its steep side should be nearest to the crop. If the furrow is likely to flood or crumble, some bait should be scattered along its length.

Destruction of crops by flying swarms is considered to be rare, at least in areas south of the Clarence River.

3. Where this bait is used *after the crop has been planted* many beetles will be killed, but, despite this reduction in beetle numbers, some degree of crop loss can be expected. In such circumstances the use of bait must be regarded largely as a palliative which can be used where the grower is not equipped to carry out the highly effective operation of jetting with D.D.T. emulsion.

4. The most effective periods for the use of this bait are:—

(i) Spring-early summer (to kill overwintering adults of the current year's generation); and

(ii) Early in the year (to kill the new generation of adults which starts to emerge in January on the North Coast and February on the South Coast).

During the colder months the bait should not be used because the beetles are inactive.

5. Until more is known of its effect on warm-blooded animals, poultry and stock should not be allowed access to the bait.

* *Heteronychus sanctae-helenae.*

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Condobolin (G. L. Maxwell) .... August 10, 11
Trundle (W. A. Long) .... August 17, 18
Narromine .... August 18
Weethalle .... August 18
Lake Cargelligo .... August 20-21
Monwonga-Bedgerebong (T. J. Radburn) Aug. 21
Peak Hill (H. J. Dawson) ...... August 24, 25
Wagga .... August 24, 25, 26
Wentworth (W. B. Crang) .... August 25
Grenfell .... August 27-28
Barellan .... August 28
Parkes (L. S. Seaborn) . August 30, 31, Sept. 1
Lockhart .... August 31, September 1
Young .... August 31, September 1
Hillston (J. G. Rose) .... September 1
Ungarie .... September 1
Deniliquin .... September 3, 4
Coolamon (R. G. Lynch) ...... September 3, 4
Murrumburrah .... September 3, 4
Cowra .... September 7, 8
Ganmain (S. J. Pratt) .... September 7, 8
Henty .... September 7, 8
Manildra (H. C. Douglas) .... September 7, 8
West Wyalong .... September 7, 8
Corowa (W. T. Easdown) ..September 10, 11
Narrandera .... September 10, 11
Mangrove Mountain (W.J.Mitchell) September 11
Barmedman .... September 11
Finley .... September 11
Forbes Sheep Show .... September 11
Canowindra .... September 14, 15
Temora .... September 14, 15, 16
Gosford (W. B. Graham) .... September 17, 18
Ardlethan .... September 18
The Rock (A. F. Walker) .... September 18
Eugowra (R. S. Noble, President) September 21, 22
Leeton .... September 21, 22
Quandialla .... September 22
Tooraweenah .... September 22
Hay .... September 24, 25
Junee .... September 24, 25
Molong .... September 24, 25
Ariah Park .... September 25
Bribbaree .... September 29
Cudal .... October 1
Illabo .... October 2
Griffith .... October 5, 6
Walbundrie .... October 6
Singleton .... October 7, 8
Culcairn .... October 9
Albury .... October 12, 13, 14
Kyogle .... October 13, 14
Cootamundra (D. H. Boyd) ... October 15, 16
Lismore National .... October 19, 20, 21
Holbrook (Thelma Stewart) .... October 22, 23
Alstonville .... October 27, 28
Murwillumbah .... November 3, 4
Mullumbimby .... November 10, 11
Bangalow .... November 17, 18
Nimbin .... November 24, 25

1949.

Albion Park .... January 14, 15
Dapto .... January 21, 22
Liverpool .... February 5, 6
Luddenham .... February 11, 12
Paterson .... February 11, 12
Tenterfield .... February 17, 18, 19
Gunning .... February 18, 19
Wyong (F. Akhurst) .... February, 18, 19
Newcastle (P. Legoe) .... February 23 to 26
Guyra .... February 25, 26
St. Ives .... February 25, 26
Yass .... February 25, 26
Walcha .... March 1, 2
West Maitland (R. E. Holroyde) .... March 2-5
Glen Innes .... March 3, 4, 5
Penrith .... March 4, 5
Queanbeyan .... March 4, 5
Uralla .... March 4, 5
Tumbarumba (Mrs. U. M. O'Shea) .. March 8, 9
Braidwood .... March 11, 12
Blacktown .... March 11, 12
Burrowa .... March 11, 12
Cessnock .... March 11, 12
Inverell .... March 11, 12
Armidale .... March 17, 18 19
Crookwell .... March 17, 18, 19
Barraba .... March 18, 19
Gresford .... March 18 19
Parramatta .... March 18, 19
Warialda .... March 22, 23
Taralga .... March 24, 25
A.C.T. .... March 25, 26
Bingara .... March 25, 26
Castle Hill .... March 25, 26
Dungog .... March 25, 26
Manilla .... March 25, 26
Muswellbrook .... March 29, 30
Tamworth .... March 29, 30, 31
Goulburn .... March 31, April 1, 2
Quirindi .... April 1, 2
Sydney Royal .... April 9 to 19
Gunnedah .... April 26, 27, 28
Boggabri .... April 29, 30
Narrabri .... May 5, 6
Hawkesbury District (Clarendon)
T. J. Cambridge .... May, 5, 6, 7

A SICK animal will often show a greater desire for water and will drink oftener than one that is well. Water has a cleansing effect on internal organs and assists the body to eliminate waste and toxic products. The elimination of these products is of great importance to the animal in overcoming its sickness.

POULTRY NOTES

COCKEREL RAISING IN BATTERIES.

A New Industry Successfully Established.

◆

V. H. BRANN,
Livestock Officer
(Poultry).

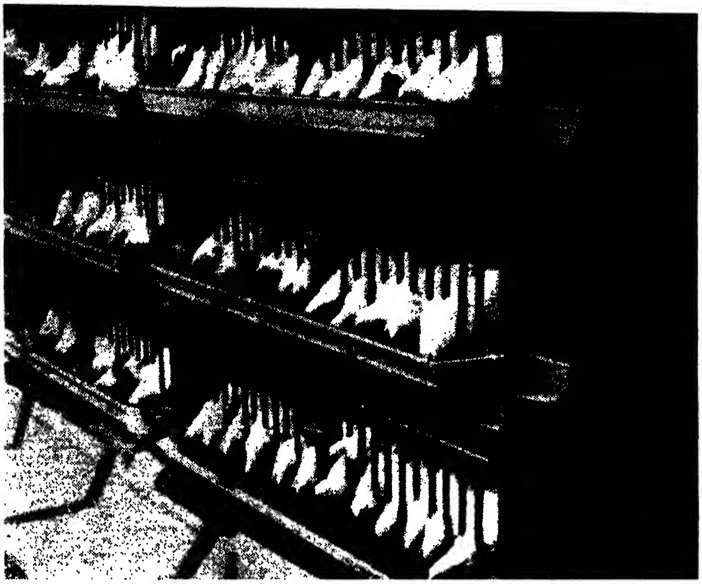


Fig. 1.—Three-tier Battery Cages at Smithfield.

COCKEREL raising in Australia, as a commercial venture, lags a quarter of a century behind the egg industry. The steady progress made by the latter dates from the time when the export of surplus eggs with all the attendant problems and setbacks made continuous expansion possible.

The present firm market for table poultry, because of the same export demand, must create a big specialised industry, and the deplorable and wasteful destruction of good, day-old cockerels should soon almost cease, except for late hatchings.

Large numbers of cockerels—hundreds of thousands of them altogether—are now being reared in batteries, and the work is progressing smoothly without the high proportion of failures experienced by the pioneers of this new industry.

There is no doubt that more cockerels would have been raised during recent years but for the shortages of all stock feeds brought about by droughts and world food shortages. Wheat may be in short supply for some time yet, but with average seasons, oats, barley and sorghums will make up for any deficiency of wheat available for cockerel rearing.

Future Prospects.

Some will contend that the large scale rearing of cockerels will soon cause glutted markets and depressed values. This contention is unsound, because the number of cockerels that can be hatched is in proportion to the demand for pullet chickens.

A depressed poultry industry would cause a lower demand for pullets, and so fewer cockerels would be obtainable. There has always been a scarcity of cockerels from May to October, and it is not likely that cockerel raising will be uneconomic while poultry are required for export.

The modern poultry abattoirs which have been installed by private enterprise at high capital cost should also inspire confidence in this industry.

Battery Rearing.

Battery rearing is more popular than other methods because parasitic diseases are more easily controlled and because of the small area required. A battery plant large enough for an out-turn of 5,000 cockerels per season would require less than half an acre. Cleanliness is vital, but there are no large areas of land that must be spelled. Also, cockerels are ready for cages at 6 weeks of age or less, and no equipment for teaching the birds to perch is necessary.

Fig. 2.—Batteries Comprising 100 Cages.
Protected from wind, but receiving winter sunshine.

Alternative Methods.

Although development in batteries is slightly quicker than range rearing, it should not be thought that the latter system is not an equally efficient method of rearing cockerels. However, to ensure equal success, at least 10 acres of land would be required to rear 5,000 chickens per season.

Movable houses or arks and colony enclosures would also mean a higher capital outlay, and their construction would be impossible while the present shortage of building and fencing materials remains.

The other alternative is to raise chickens in intensive houses. Cockerels do well with this system, but the usual ramps for perching are necessary. The risk of cannibalism among flocks in intensive houses is slightly greater than when kept in cages.

The Cockerel Rearing Season.

Chickens develop more rapidly during the colder months of the year. Those hatched as early as February may be raised in batteries, as cool weather commences as these birds develop. In some districts, including the County of Cumberland, however, there is considerable risk of fowl pox infection among chickens hatched before March, and vaccination of young chickens for immunisation appears to be definitely dangerous. When chickens are hatched after August the rate of growth as the weather becomes hotter is too slow to be economic.

March to early August is the best period to hatch cockerels so that the season is finished and the batteries are cleared about the end of the year. This allows about two months to clean up the plant, effect necessary repairs and have a respite from the continuous nature of the work and the close observation to detail which are essential to success.

The Brooder Stage.

Cockerels may be raised in battery brooders for three to four weeks, and then kept in the same brooder room in "follow on" cold batteries for "hardening" prior to placing them in the cages; or they may be reared in ground brooders for six weeks, after which time they are immediately placed in the battery cages.

A common method is to harden the chickens in weaning pens on ramps and under a canopy made of sacking for about three to five weeks before placing them in the cages. Early in the autumn the weather is mild enough to place the chickens in cages as early as four weeks after hatching, if provision is made for hanging a curtain over the cages during the night time. For chickens of this age, wires less than 1¾ inches apart are necessary to keep the chickens in the battery. Some operators use movable 10-gauge cross wires or ⅜ inch wooden dowels for this purpose.

The accompanying drawings (Figs. 5 and 6) give details of a cockerel-raising unit—consisting of a long shed which houses a continuous line of 6-cage batteries (three tiers high—to take chickens from 6 weeks old. The shed and cages should face due north—for maximum sunshine and warmth, and at the same time to afford full protection against wind from the south and west.

Although cool conditions are good for growth, chickens kept in cages cannot exert any effort or find shelter if exposed to

adverse conditions. The inevitable result of faulty environment is slower growth.

Three-tier batteries of six cages, each 2 feet wide and 2 feet 6 inches deep are the most convenient to provide adequate provision for watering. Feed troughs can be bracketed along the bottom of each cage front.

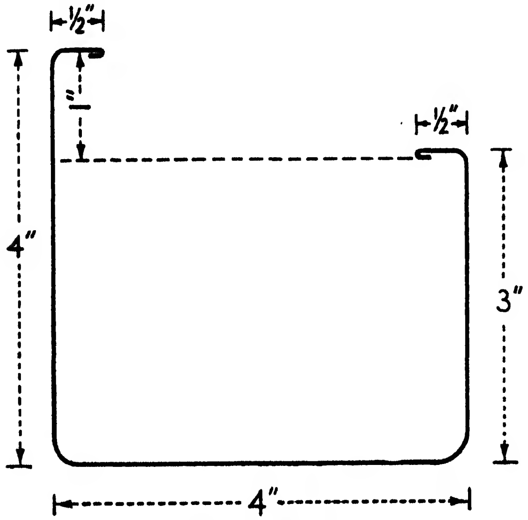


Fig. 3.—Cross Section of Feeding Trough.
Note that the side nearer the cage is 1 inch deeper than the other.

Cages of the size mentioned will each take fifteen chickens six weeks old, but the number should be gradually thinned down to seven cockerels by the time they are 14 weeks old.

The construction of the food troughs is important, since very great food wastage will occur if these troughs are not properly made. Both the front and back should have a horizontal "lip" ½ inch wide and the back of the trough, *i.e.*, the edge closest to the chickens, should be 1 inch higher than the food level when the trough is full (see Fig. 3).

Feeding.

Cockerels can be raised to the roaster stage almost exclusively on dry mash with a protein content of 18 to 20 per cent. Some wet mash and chaffed greenstuff placed on the dry mash once or twice daily is an advantage. One grain feed—enough to satisfy the immediate appetites of the birds—can be given late each afternoon.

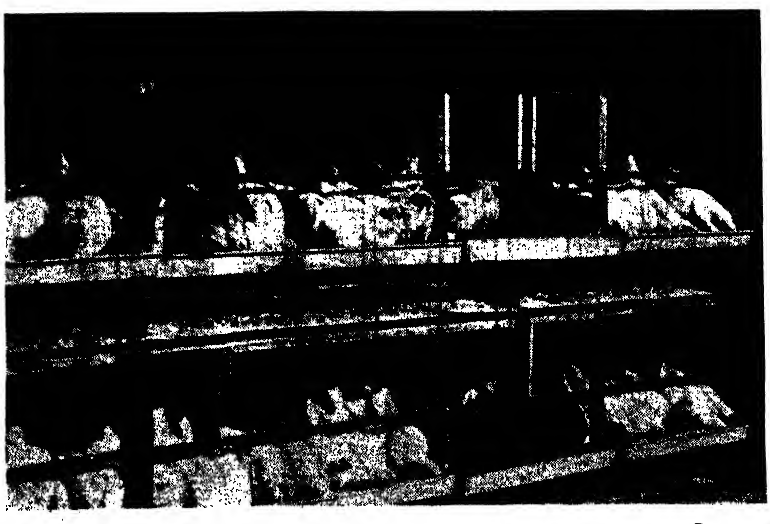
A suitable dry mash is:—

Bran	23 lb.
Pollard	35 lb.
Wheat meal, maize meal or crushed oats	20 lb.
Liver meal	5 lb.
Whey powder	5 lb.
Meat meal	10 lb.
Salt	1 lb.

This ration may be given right up to the time of marketing, and no "topping off" is necessary. The terms "topping off" and "fattening" are applied to the feeding o grown birds approaching prime condition just prior to marketing.

It is not possible to place an abnormal amount of fat on young growing cockerels.

Fig. 4.—Two-tier Battery Cages at Bankstown.



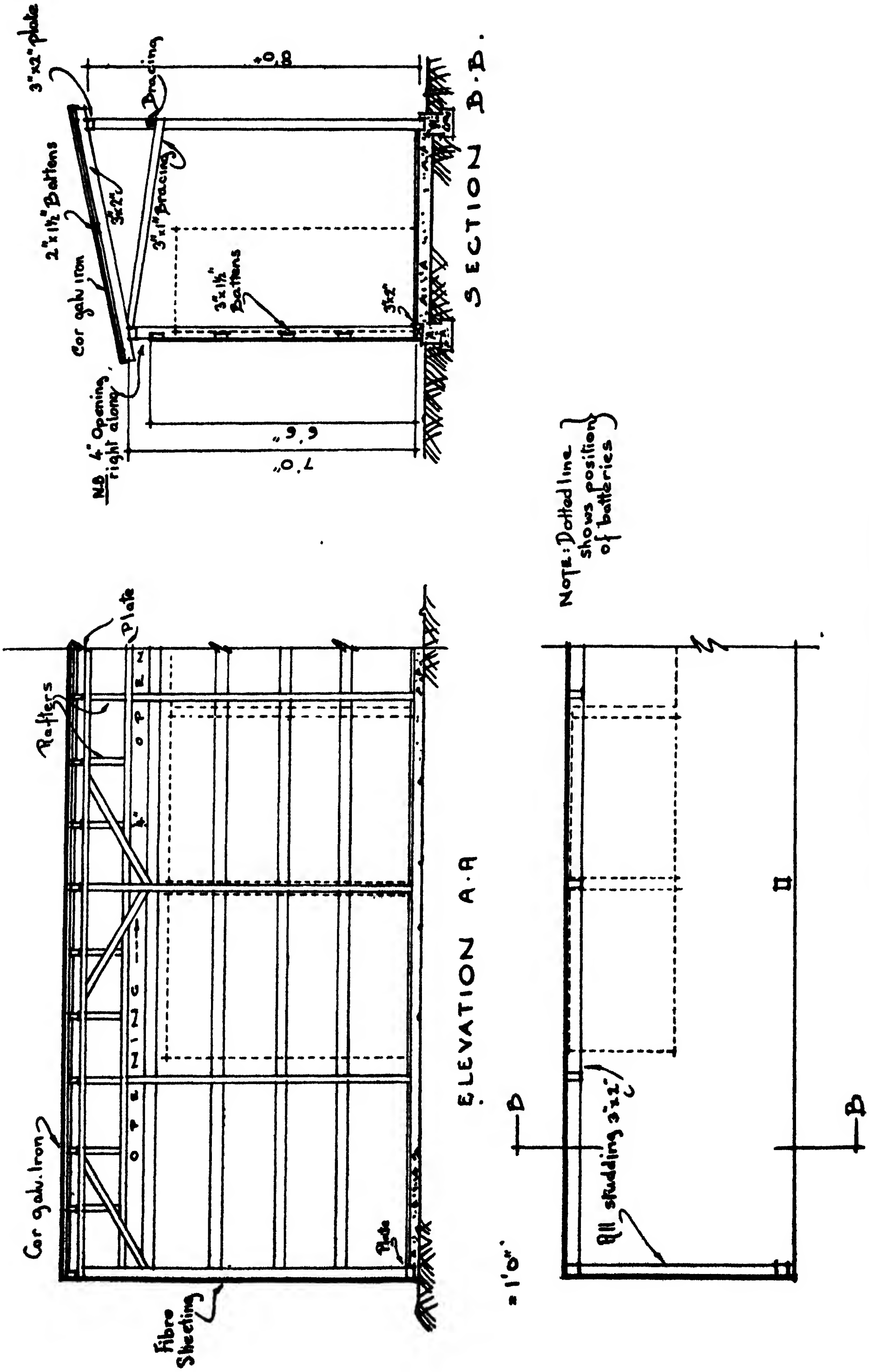
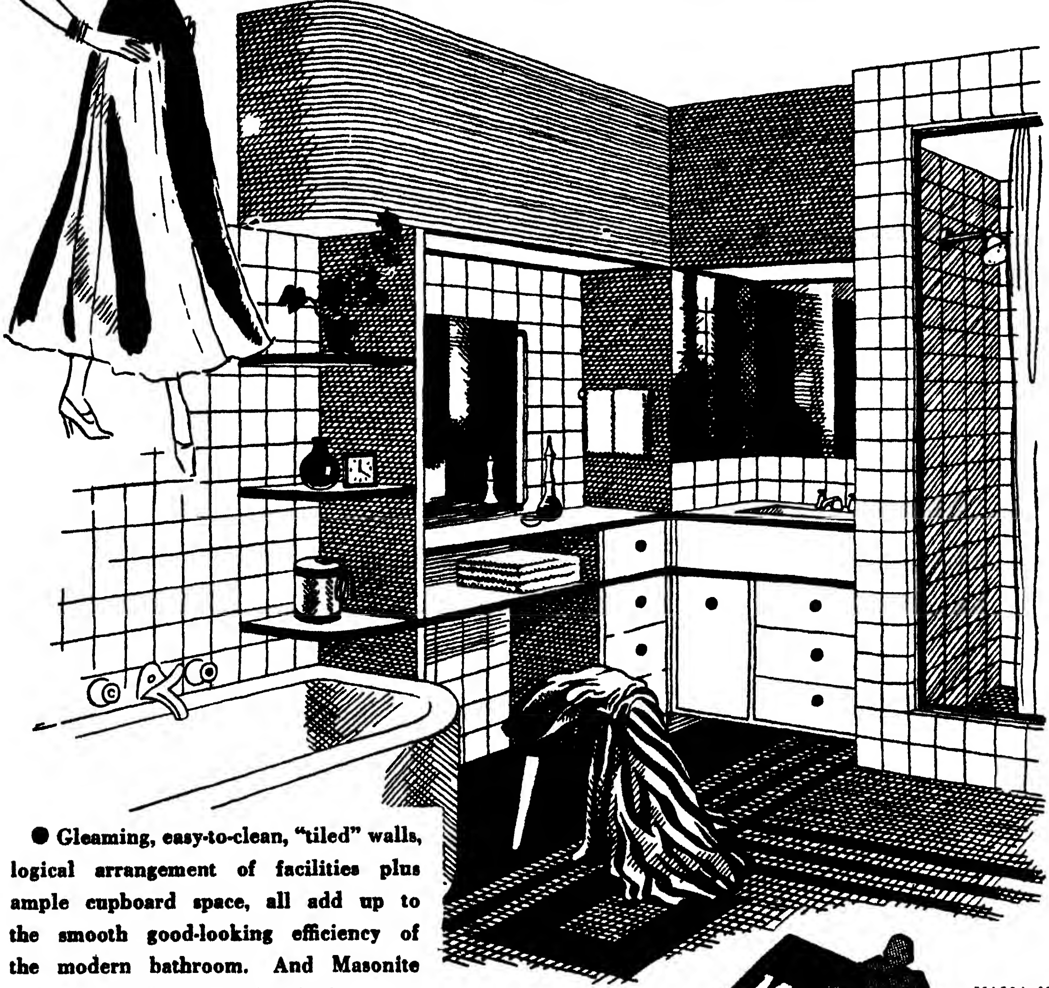


Fig. 5.—Plan and Cross Section of Battery Holding Unit.

the "New Look" moves into the bathroom



● Gleaming, easy-to-clean, "tiled" walls, logical arrangement of facilities plus ample cupboard space, all add up to the smooth good-looking efficiency of the modern bathroom. And Masonite makes this "New Look" bathroom a practical possibility for every home owner.

Masonite Temprtile gives the luxury of ceramic tiles at a fraction of their cost. Masonite Tempered Presdwood provides the ideal material for the construction of bathroom furniture.

MA21A-48

MASONITE

Although Masonite production has been greatly increased, it is regretted that you may still have some difficulty in purchasing all the Masonite you require.

MASONITE CORPORATION (AUSTRALIA) LIMITED

SALES AND SERVICE DIVISION: 369 Pitt Street, Sydney; 533 Collins Street, Melbourne; 337 Queen Street, Brisbane; 31 Chesser Street, Adelaide

Maximum fleshing by feeding a diet fairly high in protein would be a more accurate description. The feeding of mash of a sloppy consistency is not justified in battery raising, unless skim milk is available to mix the mash.

Any necessity for topping off would indicate that the birds are not in the best possible condition prior to this treatment or that they had not been correctly fed in the early stages of growth.

Breeds.

A cross between White Leghorn and any of the dual-purpose heavy breeds is ideal for battery raising. Pure White Leghorn cockerels are also suitable, but this breed is more susceptible to cannibalism than the Australorps, Rhode Island Red or crossbreds. The White Leghorn, which is a quick maturing breed, is capable of gaining a weight equal to heavy breeds up to twelve weeks of age, and as the supply of White Leghorn cockerels is always greater than that of the heavy breeds, this breed will remain prominent in cockerel raising.

Cannibalism.

Cannibalism, or picking, is one of the hazards of battery rearing, and in spite of all precautions, outbreaks will start from time to time for no apparent reason. Rearing cockerels during the warmer months increases the prevalence of this vice. When conditions are otherwise favourable, recurring cannibalism can nearly always be traced back to the brooder stage and to have had its origin in hot humid conditions in the brooder house. Apart from the brooder, the conditions in the house should be kept cool and well ventilated, especially on warm sunny days.

Any deficiency in the diet, particularly in regard to the protein, fibre and salt content will start cannibalism. The addition of about 20 per cent. of crushed oats in the mash will help to prevent picking.

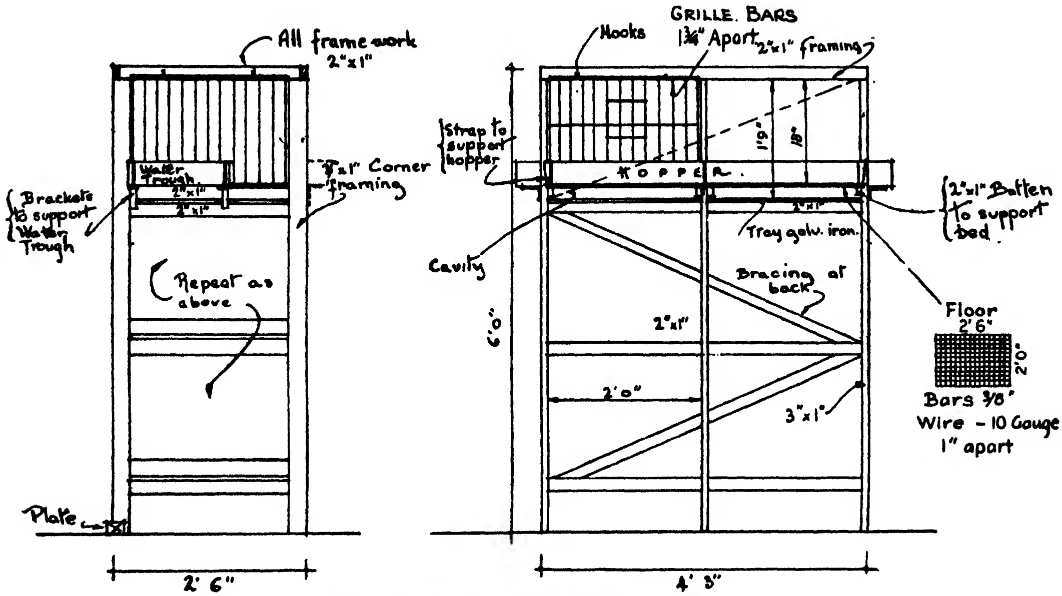


Fig. 6.—End and Front Elevations of Battery Cages.

Food Required.

It has been determined that the consumption of feed required by 100 chickens is as follows:—

1-4 weeks	100 lb.
5-8 weeks	255 lb.
9-12 weeks	370 lb.
13-16 weeks	450 lb.
Total:	1,175 lb.

It would therefore take slightly less than 6 tons of feed to raise 1,000 cockerels to 16 weeks of age, when the average weight should be 3½ lb. per bird.

In America a large industry has developed for broilers (2½ to 2¾ lb. live chickens) for chicken barbecues. An increasing demand may be expected here, but the cost of preparation of smaller birds is as high as for the bigger cockerels, and the latter realise firmer prices and have an unlimited demand.

Buyers are at present offering a long term guaranteed price of 1s. 9d. per lb. live weight for cockerels over 3 lb., and as high as 2s. per lb. is being paid. With this as a basis, the following is an estimate of expenditure and returns from a battery raising plant capable of producing 5,000 cockerels per season:—

Capital Outlay on Plant and Equipment.

		£
3	4-deck Battery Brooders at £60	180
10	4-deck follow on Cold Batteries at £16	160
	Brooder room 30 ft. x 20 ft. at £80 per sq.	480
	Auxiliary pens 60 ft. x 14 ft. ..	180
17	6-cage battery units at £16 ..	272
	Battery shed 85 ft. x 6 ft.	100
	Hoppers and sundry appliances	100
		£1,472

Expenditure.

	£
Interest on £1,472 at 4 per cent. p.a.	59
Depreciation at 4 per cent. p.a.	59
Cost of 6,000 day old cockerels at £2 per 100	120
30 tons of feed at £14 per ton	420
Power and sundry expenses	100
	£758

Revenue.

	£	s.
Sale of 5,000 cockerels at 3½ lb.: 17,500 lb. at 1s. 9d. per lb.	1,531	5
Net return per annum	£773	5

There are Pitfalls.

This estimate indicates the current cost of plant and foodstuffs. A handy man may, however, erect most of the plant at a cheaper cost, and cockerels can often be purchased at a much lower rate than that shown.

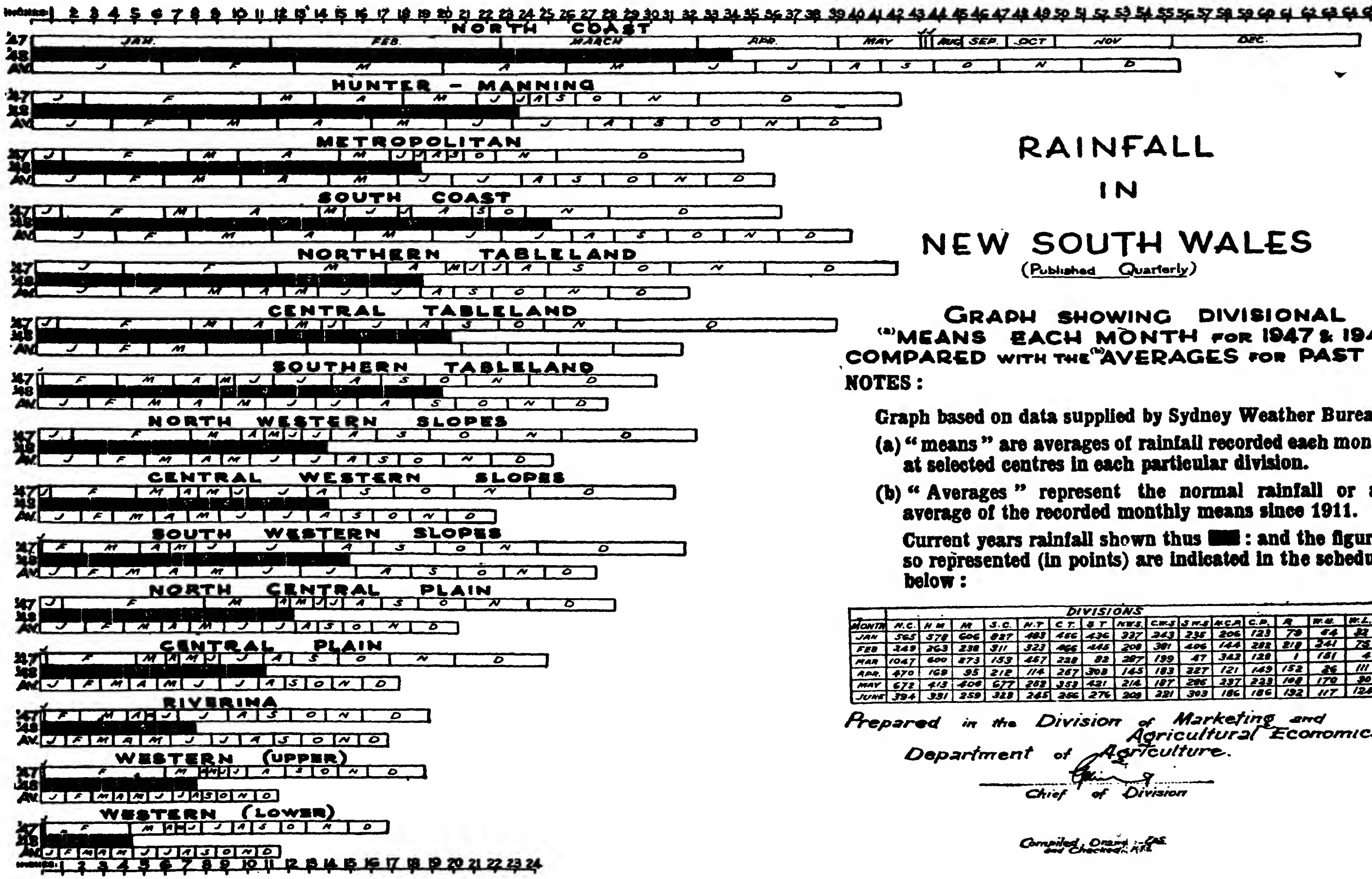
To inexperienced people the returns may appear lucrative, and a warning is necessary that there are other things to be considered in such an undertaking. The successful raising of chickens is the most skilful task in all the different phases of poultry husbandry. Cockerel raising is not an exception, and short cut methods will result in heavy losses, slow growth and failure.

A loss of 16 per cent. in rearing, allowed in the estimate, is a fair allowance where sound methods are employed. On the other hand, no allowance is made for abnormal losses or for poor development, which would result from extending the season far into the summer.

Overcrowding is the main cause of failure; it follows attempts to save the capital outlay and rear as many chickens as can be packed into the cages. As already stated, faulty conditions may cause serious losses from cannibalism, while an outbreak of disease may be serious enough to necessitate the disposal of all stock, cleaning up of the batteries and starting again. In such cases a part of the rearing season would be lost and the return lower.

On the other hand, of course, the returns are quickly obtained from this method of cockerel raising—and no primary industry is without some problems or risks.

THERE appears to have been a considerable reduction in the area sown to oats this year. This has been due to the general factors resulting in a reduction in the area sown to all winter cereals this year and in addition to the abundance of feed in most districts. In view of the prospective price for wheat most farmers have preferred to concentrate on the production of wheat this season, and for these combined reasons it is likely that the percentage reduction in the area sown to oats has been considerably greater than it has been for either wheat or barley.—MARKETING DIVISION.



RAINFALL IN NEW SOUTH WALES

(Published Quarterly)

GRAPH SHOWING DIVISIONAL (a) MEANS EACH MONTH FOR 1947 & 1948 COMPARED WITH THE (b) AVERAGES FOR PAST YEARS

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "Averages" represent the normal rainfall or an average of the recorded monthly means since 1911.

Current years rainfall shown thus ▬ : and the figures so represented (in points) are indicated in the schedule below:

MONTH	N.C.	H M	M	S.C.	N.T	C T.	S T	N.W.S.	C.W.S	S W.S	N.C.P.	C.P.	R	W.U.	W.L.
	DIVISIONS														
JAN	565	578	606	837	483	456	436	337	243	235	206	123	79	64	32
FEB	249	263	238	311	323	466	445	208	381	406	144	282	219	241	75
MAR	1047	600	273	153	457	228	82	287	199	47	342	128	1	151	4
APR.	470	169	95	212	114	267	308	145	183	227	121	149	152	26	111
MAY	672	413	406	677	283	353	421	214	187	286	237	223	108	170	90
JUNE	394	331	259	328	245	256	276	209	221	303	186	186	132	117	124

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

Chief of Division

Compiled, Drawn and Checked

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. O. "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B. Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free:—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)	30
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188
Hawkesbury Agricultural College, Richmond (Jerseys)	106
Hicks Bros., "Meryla," Culcairn (A.I.S.)	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
McEachern, H., "Nundi," Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T., "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)	49
New England University College, Armidale (Jerseys)	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	35
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco (Jerseys)	89
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Salway, A. E., Cobargo (Stud Jerseys)	57
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	200

Owner and Address.	Number in herd.
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170
Von Nida, F. E., Wildes Meadow	30
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	23
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R., "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	42
Forster, T. L., and Sons, "Abington," Armidale	62
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	72
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	69
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.) ...	120	13/11/48
Bradley, H. F., "Nardoo, Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm	55	9/6/48
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	74	2/2/49
Limond Bros., Morisset (Ayrshires)	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys)	94	27/10/48
Riverina Welfare Farm, Yanco (Jerseys) ...	91	14/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys) ...	119	20/4/48
Yanco Agricultural High School, Yanco (Jerseys)	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle ...	51	20/4/49
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale." Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus ...	209	12/8/48
Burns, R., "Wilga Glen," Coonamble ...	20	24/12/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell	32	11/8/48
Coventry Home, Armidale	11	29/9/48
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell ...	34	5/4/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	33	9/4/49
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Frizelle, W. J., Rosentein Dairy, Inverell ...	111	9/9/48
Genge, G. L., Euston, Armidale	36	22/9/48
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood ...	22	20/5/48
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	34	22/9/48
Ince, W. G., Kirkwood St., Armidale ...	11	12/4/49
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	34	22/9/48
Kenmore Mental Hospital	77	7/7/48
Koyong School, Moss Vale	2	17/6/49
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Gladesville Mental Hospital	7	12/12/48
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	40	20/11/48
McMillan, N., Duval Road, Armidale ...	30	29/9/48
MacNamara, B. "Mount View," Cessnock...	67	21/5/49
Marist Bros. College, Campbelltown ...	82	23/1/49
Mason, A., Killarney, Armidale	33	30/9/48
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Mullholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville ...	45	5/2/49
O'Brien, O., "Mount View," Inverell ...	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	12	29/12/48
St. John's Hostel, Armidale	6	24/6/49
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills ...	29	11/6/49
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	54	5/4/49
S.C.E.G.S., Moss Vale	34	8/4/49
Tanner, F. S., Dural Rd., Armidale	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale ...	33	30/9/48

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
Tombs, P. C., Kellys Plains, Armidale ...	49	29/9/48
Tombs, R., Harlwood, Armidale	40	22/9/48
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48
Von Frankenberg, F. E. "Spring Hills," Camden	68	12/12/48
Waters, A., Marsh Street, Armidale	2	13/10/48
Watson, F. J., Golf Links Rd., Armidale ...	5	7/10/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	52	10/6/48
Williams, L. B., "Birida," Armidale ...	39	12/4/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Sheep Classing.

Characters Desirable in a Flock.

HOWEVER small the flock, periodical classing should be a feature of its management if it is to give maximum returns. The following desirable characters should be kept in mind when culling:

1. Good strong heads without coarseness. Thin faces and narrow pinched nostrils denote poor constitution.

2. Good mouth, the teeth meeting the pad properly. A long or short underjaw prevents the sheep from feeding properly, and this is much to its detriment when conditions are unfavourable.

3. Big frame and well-shaped deep body, giving area on which to grow wool and roominess for breeding purposes.

4. Wide at shoulders and slightly arched over the wither. A peaked wither is undesirable, as it is usually associated with a narrow chest and weak constitution.

5. Good top line, back level and rump rounded and not drooping. Cull all sheep with devil's grip or malconformation at shoulders.

6. Good underline, deep in front and deep in the flank.

7. Front legs straight and set wide apart; hind legs wide at the hocks. Avoid sheep which brush at the hocks or have hocks that curve inwards.

Sheep light in bone or with bad feet or long weak pasterns should also be culled.

Another feature which must be taken into consideration is the amount of development or wrinkling in the sheep. Owing to the predisposition of a wrinkly crutched sheep to blowfly strike, it is advisable to eliminate them from the breeding flock. It is possible to breed sheep comparatively plain in the crutch and at the same time carrying a dense fleece.

The Most Common Faults in Wool.

Covering must be considered from the aspects of quantity and quality. Weight of fleece is essential; this is obtained from size of sheep and length and density of the fleece. The ideal is to obtain good length of staple, combined with good density and quality.

The commonest faults in wool are lack of density, lack of bulk or body in the wool, lack of length, lack of crimp or character known as plainness, harshness in handle of the wool (a very serious but fairly common fault in Merino wools), bad colour (either from excess yolk, undesirable type of fatty yolk, or badly bred sheep), unevenness in covering, and the presence of hair or kemp in the fleece.—SHEEP AND WOOL BRANCH.

Results of Research

Now Quickly Applied.

A STATEMENT by Professor J. A. Prescott that: "It is the speed and certainty with which technical advances follow scientific discovery that have made scientific research in agriculture such a sound investment to-day," is a significant one. It expresses a new viewpoint to that commonly held—that it would pay to halt agricultural research for a period of years and concentrate on the spread of knowledge available.

The Professor made the statement when delivering the 1948 Farrer Oration at the Annual State Conference of the Agricultural Bureau of New South Wales at Hawkesbury Agricultural College.

Describing the acceleration of the rate at which new discoveries in relation to soil fertility had been applied to practical farming, he said: "It took 400 years before the simple pot experiment of Nicolas to find out how plants grow, found its practical application in the development of the chemical fertilisers of modern agriculture . . .

"The scientific importance of zinc in life was first suggested about 1870, and it was sixty years before it found practical application. It took thirty years before the ideas of the theory of electrolyte dissociation found their practical application to the study of the pH values of soils, and it was another ten years or more before farmers became familiar with the idea. In the case of molybdenum there was only about ten years between the laboratory discovery and the field application. In the cases of manganese and cobalt the scientific work and the practical application were worked out together."

A brief review of the many discoveries of agricultural research in comparatively recent years brings with it an appreciation of the enormous opportunities for development that would follow general acceptance of this new knowledge.

The Professor spoke particularly of plant nutrients, but it is a refreshing fact that there is an increasing tendency to put the great range of recent discoveries of agricultural science to practical use. On every side, progressive primary producers are trying out applications of trace elements to correct deficiencies; using plant hormones to kill weeds, hold fruit on trees and in many other ways; spraying and dusting their seeds and plants with modern insecticides and fungicides of complex composition; using new drugs to control internal and external parasites of stock; growing new varieties of crops bred for

their resistance to disease or their value for specific purposes; and taking advantage of the work of scientists in many other ways.

Full benefit will not, of course, be obtained from these new methods and materials until they are accepted by the less progressive farmer. It is the task of the extension services to take this knowledge to him—and in this work the most modern methods must supplement the old. Many new educational techniques—the use of talkie films, radio, the discussion group method and the like—have been devised in recent years and these must be increasingly utilised if maximum advantage is to be taken of the knowledge being increasingly made available by agricultural research.

Professor Prescott emphasised the value of this application of research when he said at the conclusion of his oration "It is on the basis of such knowledge that a prosperous agricultural and livestock industry must be built."

Superphosphate Supplies for 1949.

Take Early Delivery.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.), states that "Farmers should be able to obtain full requirements of superphosphate for next season if they place firm orders early, and take delivery of up to 50 per cent. of requirements before 31st December next."

Mr. Graham said that a recent meeting between representatives of his Department and fertiliser firms, farmers' organisations and the New South Wales Government Railways, had recommended that the attention of farmers be drawn to the need for taking delivery, between October and December, of half of next season's superphosphate requirements for autumn topdressing and for cereal sowing.

The tremendous demand that would be made on the New South Wales Railways, said the Minister, meant that there would be difficulty in delivering what would possibly be a record quantity of superphosphate, between the months of January and May; hence the need for farmers to take delivery of a substantial portion of their orders between October and December.

Many farmers were in the habit of ordering their superphosphate early but did not confirm the orders until February or March. Fertiliser firms had informed him, said Mr. Graham, that those tentative orders were not recognised by them until confirmed. They suggested early confirmation, and payment for at least that portion ordered for delivery before the end of December.

Mr. Graham said that as only Nauru Island phosphate rock was now being used for the manufacture of superphosphate, there was not the same possibility of it going lumpy in the bags if early delivery was taken.

Pasture Improvement in Relation to Soil Erosion.

PASTURE improvement is an essential part of defence against soil erosion. While mechanical means, such as contour banking of cultivation land, and various methods of handling gully erosion, when efficiently designed and maintained, have proved very valuable in slowing the erosion process and even reclaiming badly eroded areas, they do not provide a complete cure for the underlying cause of erosion—the destruction of surface cover and organic matter in the surface soil.

There is considerable difference of opinion on the efficacy of trees in preventing soil erosion. While it is conceded that virgin forest or bushland provides very adequate control by reason of the soil cover of twigs, leaves and bark, forest or bushland disturbed by grazing animals may provide little or no control. There are many instances to-day of areas such as stock routes, reserves, etc., where, though green timber is comparatively dense, serious erosion has occurred because the soil cover has been removed by overstocking.

Rabbits have contributed considerably to the overstocking and removal of surface cover, and while they have added to our national income they have caused immeasurable loss, not only in robbing sheep and cattle of pasturage, destruction of crops and the cost of their control, netting fences, etc., but also in damaging, sometimes irreparably, our greatest asset—the surface soil.

Provision of a more or less permanent surface cover, with addition of organic matter to the soil, by means of a suitable pasture, is the only permanent answer to the soil erosion problem, and removes the cause. To-day there are many examples of land which has been reclaimed by pasture improvement—land which at one time was eroding badly and on which surface tanks silted up, but which now only shows indistinct traces of the former havoc and on which the run-off is now so small that special additional provision must be made to supply water for stock.—DIVISION OF PLANT INDUSTRY.

WORM DISEASES IN PIGS.

Methods of Prevention and Control.

O. M. MACPHERSON, B.V.Sc., Veterinary Research Officer, Veterinary Research Station, Glenfield.

PIGS become infested with many different species of round worms, tape worms and flukes. They invade the bowel, the liver, the lungs, the skin, in fact every part of the pig's body. Drugs and control measures which will combat one species may have little or no effect on others. Each kind of worm spends part of its life cycle inside the pig and part on the ground or in some other animal or insect. A knowledge of their internal life cycles tells us how the different species affect the pig and the treatments which are most likely to be effective against them; a knowledge of their external life cycles indicates the manner in which the different worms get into the pig and the control measures which will prevent them getting there.

How Pigs Become Infested.

All the round worms, the group which is the most serious in New South Wales, grow to maturity inside the pig and then lay eggs which are passed out in the dung or faeces. The eggs of some species such as the large round worm become infective when a small immature worm, or larva, develops inside them. The pig swallows the infective egg which hatches in the bowel. When the worm grows to maturity it begins laying eggs again.

The larvae of other species (*e.g.*, nodule worm) hatch out of the egg and feed and grow on the soil until they reach the infective stage. Infective larvae are swallowed by the pig or, as is the case with the kidney worm, may actively penetrate the skin. Only eggs and larvae which have reached the infective stage can infest the pig.

A third group, which includes the lung worms, require an intermediate host such as dung beetles, beetle grubs, or earth worms to complete their life cycle. These eat the worm eggs which hatch inside them and are, in turn, eaten by the pig. The worm larvae are then set free to infest the pig.

Worm eggs and larvae are too small to be seen by the naked eye but they can be detected under the microscope. Once the worms have reached the egg-laying stage it is possible, by a laboratory examination of sample of dung, to determine with which species a pig is infested. It is also possible to recover the eggs of some species from the soil; as many as 30,000 large round worm eggs have been found in one ounce of soil collected from an earthern run.

PREVENTION AND CONTROL OF WORM DISEASES.

Worms are prolific egg layers. One female large round worm can lay up to 200,000 eggs per day and their eggs may remain alive in the soil for up to five years. Unless precautions are taken, worm eggs gradually accumulate in the soil so that the pigs are exposed to the risk of ingesting massive numbers as time goes on. The danger is greater in that the usual symptoms of moderate worm infestation, such as slow weight gains, unevenness in growth, poor appetites, and

Fig. 1.—Worms Retard Growth.
These pigs are litter mates. The retarded pig has a moderate large round worm infestation. The larger pig was treated with sodium fluoride and reared on concrete.
[*Photo: G. H. Hendy.*

chronic pneumonia are frequently not diagnosed until the contamination of the piggery with worm eggs and larvae is so great that severe losses occur. Control measures then become difficult and costly. Therefore the only sure way of preventing worm diseases in pigs is to design and run the piggery in such a manner that the ingestion of worm eggs and larvae can be kept down to the minimum.

Designing the Piggery to Combat Worm Diseases.

The general conditions which favour the accumulation of worm eggs are dampness and dirt, overcrowding, and permanent earthern runs or paddocks. On piggeries with a limited acreage the system of running pigs entirely on concrete until market age is advisable. The initial cost of the concrete is not as great as the permanent economic loss which results from trying to rear slow-maturing, unthrifty pigs on small, overcrowded earthern runs.

Concrete yards sould have a gradient of not less than one in thirty, with an adequate system of drainage leading away from the piggery. If each block is constructed so that the houses and feeding and water troughs are placed at the high end of the pen, the pigs, unless overcrowded, will pass their dung and urine at the lower end. In this way there is a minimum contamination of feed and water with dung and urine containing worm eggs, and cleaning of the pen is made easier.

Houses should have concrete or wooden floors, and be so constructed that they can be cleaned easily. They should have wide swing-back or sliding doors to allow the maximum penetration of sunlight. All manure should be removed daily and pens and yards scoured as frequently as possible with hot caustic.

If plenty of land is available and pigs can be run in large paddocks it is essential to adopt some long-range system of rotational use of paddocks, in order to prevent the land from gradually becoming contaminated with worm eggs. Short-term crop rotation will not destroy resistant eggs like those of the large round worm, but with sufficient planning the available paddocks can be grouped into units of three so that the paddocks constituting any one unit are spelled for a period of at least two years. (See Diagram A.)

DIAGRAM A.—ROTATION SCHEME FOR CONTROLLING WORMS.

Year.	Unit A.	Uni B.	Unit C.
1st Year ...	Pigs, alternating with seasonal crops.	Spell, crop, or graze farm stock other than pigs.	Spell, crop, or graze farm stock other than pigs.
2nd Year ...	Spell, crop, or graze farm stock other than pigs.	Pigs, alternating with seasonal crops.	Spell, crop, or graze farm stock other than pigs.
3rd Year ...	Spell, crop, or graze farm stock other than pigs.	Spell, crop, or graze farm stock other than pigs.	Pigs, alternating with seasonal crops.
4th Year. (Repeat of first year).	Pigs, alternating with seasonal crops.	Spell, crop, or graze farm stock other than pigs.	Spell, crop, or graze farm stock other than pigs.

Each unit consists of one or more paddocks—which need not be adjacent. Only the paddocks constituting one unit are used for pigs in any single year; that is each unit is kept free of pigs for a period of two years. In this manner continuous contamination of the paddocks with worm eggs is avoided and even very resistant eggs like those of the large round worm are killed off by the long-term spelling. The system is most easily applicable where pigs are run under open range conditions. In modified forms it can be practised on intensive piggeries in order to conserve clean ground.

Houses which are placed on wooden sleds can be moved from one part of the paddock to another or from paddock to paddock. Self-feeders, feeding and water troughs should be placed on a wooden or concrete sloping area. All depressions and mud wallows should be filled in.

Young pigs are usually most severely affected by worms, although grown pigs can pass large numbers of worm eggs without showing any marked symptoms. Therefore it is advisable never to place weaners in paddocks where older pigs have been running. Overstocking, although it may bring quick returns for a short period, is always, in the end, dangerous and unprofitable.

Danger of Introducing New Stock.

Bought pigs, although they may look healthy, may introduce new worms on to a property or help build up a light infestation which is already there. It is always advisable to have an isolation pen or paddock in which new stock can be placed for treatment and observation before they are allowed to come into contact with other pigs.

The Value of Drugs.

Drugs which will remove one kind of worm may not remove others, and some worms (*e.g.*, the kidney worm) cannot be attacked by any known drug. There are many worm medicines on the market but these vary greatly in efficiency. Further these drugs, unless given strictly in accordance with the recommendations, may be toxic. Therefore it is necessary to know which species are infesting the pigs so that the most suitable drug can be selected. It is not always easy to make a specific diagnosis from the symptoms, and even if a pig is opened up it is likely that the smaller worms will be missed by an untrained observer. If a farmer suspects worm infestation he is best advised to consult his local Stock Inspector or, if this is impracticable, to forward a diseased pig or samples of dung to the Veterinary Research Station, Glenfield, for laboratory examination.

Single or haphazard treatments are not of much value. No drug, however efficient, can be guaranteed to remove all the worms in every pig. The immature forms of worms, such as larvae of the large round worm, may cause severe damage before they have grown to the stage at which they can be removed by drugs. Therefore after pigs have been given one treatment they should be removed to an uncontaminated holding pen or run and be treated again at a suitable interval (usually two weeks).

Once the whole piggery has become heavily contaminated with infective eggs and larvae, drug treatment alone is ineffective since the pigs are continually exposed to reinfestation. Drugs are rarely a "cure" for worm diseases, but when combined with adequate control measures, systematic drug treatment helps to limit the number of worm eggs in the piggery which would otherwise be eaten by susceptible pigs.

Recommended Drugs and How to Use Them.

The four most useful worm remedies for pigs at present on the market are:—

(*a*) *Oil of Chenopodium.*—This drug will remove the mature forms of the large round worm. The dose rate is 1 c.c. of Oil of Chenopodium mixed in 1 to 2 ounces of castor oil or liquid paraffin for every 25 lb. of live weight. Pigs should be starved for 18 to 24 hours before and for 4 hours after treatment. It is inadvisable to treat pigs before they are ten weeks old.

The drench can be given by one of the following methods:—

(1) Stomach Tube (Fig. 2).—This is the safest and least expensive method. The equipment needed is a pig gag (which can be made by the local blacksmith), a glass measuring cylinder and the stomach tube, which consists of about 2 feet of rubber tubing attached at one end to a tin funnel.

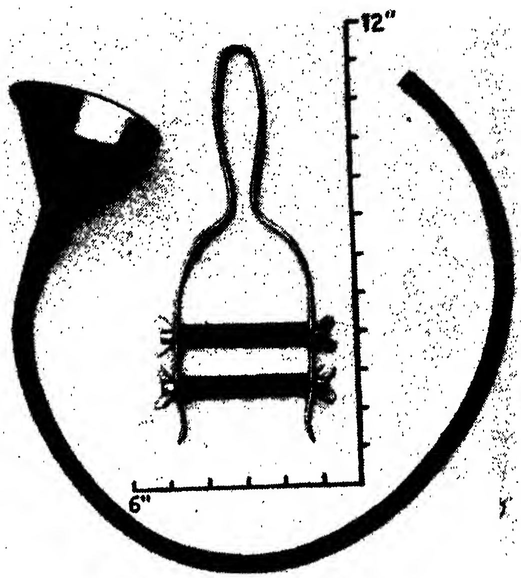


Fig. 2.—Pig Gag and Stomach Tube.
The scale is marked off in inches.
[*Photo: G. H. Hendy*

Moderately flexible tubing with an internal diameter of 7/16 inch is the most satisfactory, but a smaller bore may be necessary for very young pigs.

The free end of the tubing is guided over the back of the tongue and pushed firmly down into the food passage. If it meets with resistance it is withdrawn slightly and replaced down and over the back of the tongue. When it has passed correctly into the stomach irregular gurgling sounds are heard through the funnel. If it passes by mistake into the windpipe, which happens very rarely, the pig will cough and breathing sounds can be heard through the free end.

The drench is poured into the funnel from the measuring cylinder, and when it has passed through the funnel the tube is

withdrawn slowly, the rubber being passed through the fingers to expel any of the drug remaining inside it.

With a little practice the stomach tube can be passed very easily and quickly. There is no risk of the drug passing into the windpipe even if the pig struggles dur-

Fig. 3.—Method of Restraint for Drenching Pigs.

The pig is held between the legs of an assistant who places the gag in position. The stomach tube is passed and the drench poured into the funnel.

[Photo: G. H. Hendy.

ing dosing, and each pig receives an accurate dose. The disadvantage is that in cold weather a heavy substance like castor oil passes down the tube slowly. This can be overcome by warming the oil before use or by forcing it through the stomach tube with a drenching gun.

(ii) Drenching Gun.—The most suitable type of drenching gun for pigs is one with a long, curved nozzle which fits over the back of the tongue. The drenching gun has several disadvantages. Even when the drench is measured accurately, if the pig struggles some of it is likely to be lost or pass into the windpipe and cause pneumonia.

(*b*) *Carbon Bisulphide.*—This is recommended for removing the stomach worms. The dose rate is 4 to 5 c.c. for every 50 lb. live weight. Pigs are starved as for treatment with Oil of Chenopodium and the drug is best administered by stomach tube but it can also be given in capsules. Carbon bisulphide sometimes makes pigs vomit and stagger for a short while. It is well to remember that it is a highly inflammable substance.

(*c*) *Sodium Fluoride.*—This is a very cheap and efficient drug for removing mature and immature forms of the large round worm in the bowel, and will also remove the large stomach worms and a percentage of thorny-headed worms and whip worms. But unless the recommenaations are strictly adhered to it is likely to cause retardation of growth, gastric upset and even death.

Sodium fluoride is bought in powder form, and commercial grades, if they contain 80 per cent. or more of sodium fluoride, are satisfactory. The dose rate is 0.15 gm. per 1 lb. live weight. This is equivalent to 1 ounce for eight 25 lb. pigs or four 50 lb. pigs.

Mass treatment is a satisfactory method of administration provided it is carried out in the following manner:—

(1) Divide the pigs to be treated into groups which are even in weight and stamina.

(2) Find out before treatment is commenced how much dry feed each group will eat in one day.

(3) Weigh the required amount of sodium fluoride and mix the *dry powder* evenly in one day's *dry ration* for each group.

(4) Provide enough troughs to allow all the pigs equal access to the feed. Narrow troughs with cross bars are the most suitable. See that the troughs are clean and dry before use.

(5) Commence treatment in the morning after starving the pigs for 24 hours, and withhold all other feed until the following morning. If any of the treated feed remains it is then discarded and the pigs are returned to their normal ration.

PRECAUTIONS IN USING SODIUM FLUORIDE.

(1) Do not, under any circumstances, use sodium fluoride in fluid form or in a wet mash.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(2) Do not guess the weights of the pigs or the weight of the drug. If you do not possess accurate scales for weighing the sodium fluoride your local chemist will do it for you.

(3) Do not guess the amount of feed which each group will eat in one day.

(4) Do not treat scouring, pneumonic, or obviously weak pigs.

(5) Do not give the sodium fluoride in whole grain. The powder can be mixed evenly in ground grain, wheatmeal or oatmeal.

(*d*) *Phenothiazine.*—This is very efficient for removing nodule worms but has little or no effect against the other pig worms. The dose rates are as follows:—

Pigs up to 25 lb. weight—1/6 oz. phenothiazine.

Pigs 25 lb. to 50 lb. weight—1/4 oz. phenothiazine.

Pigs 50 lb. to 100 lb. weight—1/2 oz. phenothiazine.

Pigs 100 lb. to 200 lb. weight—2/3 oz. phenothiazine.

Pigs over 200 lb. weight—1 oz. phenothiazine.

Phenothiazine is marketed under various trade names in the form of a fine green powder or as a fluid suspension. It can be administered as a drench by stomach tube or be mixed up in the feed and given to individual pigs or to pigs in groups. Where group treatment is undertaken the method is the same as that used for sodium fluoride except that phenothiazine can be given in a wet mash. Pigs should be starved for about twenty-four hours before treatment in order to make them sufficiently hungry to eat the feed. No starvation is necessary if the drug is given as a drench.

Phenothiazine should not be given to pregnant sows. For other pigs it is reasonably safe but may, at times, produce various symptoms such as skin rashes, sore eyes, lack of appetite, and unsteady gait. For these reasons the recommended dose rates should be strictly adhered to and individual treatments, which ensure that each pig gets the correct amount, are preferable to the method of group feeding.

Restraint for Drenching.

Pigs if weighing anything up to about 70 to 80 lb. can be caught and held in a sitting position between the legs of an assistant who also places the gag in position and holds it while the operator passes the stomach tube and gives the drench (Fig. 3).

Fig. 4.—Method of Restraint for Large Pigs.
The rope is looped under the upper jaw, passed over a cross beam and the animal hauled into a sitting position.
The gag is then inserted.
[*Photo: G. H. Hendy.*

For heavier pigs two or more assistants may be required. If a suitable crush is not available a large pig can be restrained in the following manner:—A looped rope is placed round the upper jaw and over a cross beam. The pig is hauled into sitting position and the gag is inserted (Fig. 4).

(*To be continued.*)

REFRESHER COURSES FOR EX-SERVICEMEN.

First Year's Work Reviewed.

SHORT Refresher Courses for the training of ex-servicemen have been conducted in this State for just over twelve months, the first course having been officially opened by Hon. E. H. Graham, M.L.A., Minister for Agriculture, at Wagga Experiment Farm, on 14th July, 1947.

Reviewing the progress made in the interim, Mr. Graham said: "Since that date 160 ex-servicemen trainees have received short but intensive training in various aspects of agricultural activity designed to fit them for the tasks which they will encounter when they enter into possession of their own farms under the Government's War Service Land Settlement Scheme."

The syllabus for these courses had been drawn up by the Department and the trainees themselves, said Mr. Graham, and included farm management and agricultural economics, irrigation practices, soil conservation, etc. "In addition to the general syllabus," added the Minister, "specialist classes have been provided in sheep, wool and mixed farming, dairy farming and pig raising, horticulture and poultry farming, and experts of the Department of Agriculture are available to give individual instruction to trainees on these matters."

Recent courses had been held at the Yanco Experiment Farm which was considered to be ideal for the purpose, said Mr. Graham, being situated in the centre of a district noted for Merino sheep, fat lamb raising, wheat, fruit, rice and vegetable growing, pasture improvement and irrigation farming. In addition the Yanco Experiment Farm itself had a first-class dairy herd and piggery.

Trainees were also given the opportunity of visiting privately owned farms and station properties in the district and with the co-operation of the Department of Education could attend instruction in wool-classing at the Yanco Agricultural High School. Arrangements had also been made whereby they could observe the experimental work being carried out at the Soil Conservation Station at Wagga and the work of the Council for Scientific and Industrial Research at Griffith.

During the courses full Commonwealth Rural Training Scheme rates and allowances were paid to trainess who, in addition, receive free rail travel to and from the training centre.

Future Courses.

"In view of the demand by ex-servicemen for rural training it has been decided to hold a course beginning on 10th January, 1949, in addition to those already planned," said Mr. Graham. "The continuance of the Refresher Courses after January next will depend entirely on the number of trainees coming forward."

The Minister advised all ex-servicemen who hold qualification certificates under the War Service Land Settlement Scheme and who desire to enrol for training under this scheme to apply as soon as possible to the Deputy Co-ordinator of Rural Training, Department of Agriculture, Sydney.

Applications from ex-service personnel, who have been discharged for less than one year, should be forwarded to the Director of Re-establishment, Ministry of Post-War Reconstruction, Grace Building, Sydney.

CONTRARY to a prevalent impression, good housing of pigs, as of any other form of livestock, costs very much less than bad—in the long run. A pig that is warm and comfortable in inclement weather demands less from his stores of energy for maintenance. If he is cold and wet much of the energy derived from his food is used in maintaining the body temperature, and thus less is available for growth and fattening. Pigs forced to live without adequate shelter are more susceptible to infections and thus more readily succumb to pneumonia, pig paratyphoid, swine erysipelas and various joint affections.

The faults commonly present are: (1) Insufficient shelter and draughty housing, (2) damp flooring, (3) badly drained yards and pastures, (4) overheating through crowding in small sties, and subsequent chill.—DIVISION OF ANIMAL INDUSTRY.

MAIZE VARIETY RECOMMENDATIONS

For 1948 Sowing.

W. D. KERLE, H.D.A., Special Agronomist.

SOWING the right variety at the right time and using only sound, bright, pure seed from a reliable source, are axioms in maize growing.

It is essential to success that only varieties suited to the district should be sown, and growers are recommended to use those set out below for grain and green fodder in the various maize-growing districts of the State. These recommendations are based on trials which have been conducted by the Department for a number of years in co-operation with farmers in these districts.

Growers are advised to make early arrangements for seed supplies, and if in doubt as to which variety to sow to communicate with the Department or get into touch with the District Agronomist.

Hybrid Maize.

Many inquiries are being made for hybrid seed maize. A maize hybrid is not a fixed variety of maize and it takes many years of painstaking breeding, selection and field testing to produce hybrid types suitable for different localities.

Orders are being taken for the supply of hybrid seed maize produced at Grafton Experiment Farm, and suitable for North and Central Coast districts.

In addition, single cross maize seed, which has been raised by the Department at some of its Experiment Farms, is being distributed to seed growers who are participating in a scheme organised by the Department for the production of registered hybrid seed maize.

The conditions governing this scheme were published in the June issue of the *Agricultural Gazette*. Reprints may be obtained on application to the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Approximate Order of Maturity of Varieties Recommended.

Very Early.—Early Morn, Golden Glow.

Early.—Wellingrove, Duncan, Golden Superb, Iowa Silvermine, Funk's Yellow Dent, Large Goldmine, Hawkesbury White.

Midseason.—Hickory King, Leaming, Golden Nugget, Golden Beauty, Murrumbidgee White, Manning Silvermine, Giant White, Manning Pride.

Late.—Yellow Hogan, Fitzroy, Large Red Hogan, Pride of Hawkesbury.

Varieties Recommended for Grain.

UPPER NORTH COAST.

(*a*) *Tweed River.*

Early Sowing.—Leaming, Wellingrove.

Main Sowing.—Fitzroy, Manning Pride.

(*b*) *Lower Richmond River.*

Early Sowing.—Leaming, Golden Superb.

Main Sowing.—Fitzroy.

Second-class Soils.—Hickory King.

(*c*) *Upper Richmond River.*

Early Sowing.—Leaming, Fitzroy.

Main Sowing.—Fitzroy.

(*d*) *Clarence River.*

Early Sowing.—Leaming, Golden Nugget.

Main Sowing.—Fitzroy, Golden Nugget, Golden Superb.

Late Sowing.—Golden Superb.

Second-class Soils.—Hickory King.

(*e*) *Coramba District.*

Early Sowing.—Leaming, Golden Superb.

Main Sowing.—Fitzroy, Leaming, Golden Superb.

Second-class Soils.—Hickory King.

(*f*) *Bellinger River.*

Early Sowing.—Leaming, Golden Superb, Iowa Silvermine.

Main Sowing.—Fitzroy, Giant White, Golden Superb.

Second-class Soils.—Hickory King.

(g) Dorrigo District.

Main Sowing.—Leaming, Grace's White.

Sowing after Potatoes.—Golden Superb.

(h) Ebor District.

Main Sowing.—Wellingrove.

MIDDLE NORTH COAST.

(a) Nambucca River.

Early Sowing.—Golden Superb, Leaming.

Main Sowing.—Giant White, Fitzroy, Golden Superb.

Second-class Soils.—Hickory King.

(b) Lower Macleay River.

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Yellow Hogan, Leaming, Giant White.

(c) Upper Macleay River.

Early Spring.—Golden Superb.

Main Sowing.—Fitzroy, Yellow Hogan, Leaming, Golden Beauty, Hickory King, Giant White.

(d) Hastings River.

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Golden Beauty, Golden Nugget, Leaming, Hickory King, Giant White.

(e) Lower Manning River.

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Leaming, Manning Silvermine, Giant White.

(f) Upper Manning River.

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Leaming, Manning Silvermine, Giant White, Manning Pride.

(g) Comboyne and Bulga Districts.

Main Sowing.—Golden Superb, Leaming, Hickory King, Golden Nugget.

(h) Wallamba District.

Early Sowing.—Golden Superb, Iowa Silvermine.

Main Sowing.—Giant White, Fitzroy, Golden Nugget, Leaming, Manning Silvermine.

CENTRAL COAST.

(a) Gloucester District.

Early Sowing.—Golden Superb.

Main Sowing.—Fitzroy, Hickory King, Leaming, Giant White, Golden Nugget.

(b) Lower and Central Hunter River.

Early Sowing.—Golden Glow, Golden Superb, Duncan.

Main Sowing.—Leaming, Funk's Yellow Dent, Fitzroy, Golden Nugget.

Late Sowing.—Golden Glow.

(c) Hawkesbury River.

Early Sowing.—Golden Superb, Leaming.

Main Sowing.—Fitzroy, Yellow Hogan, Manning Silvermine, Pride of Hawkesbury, Hawkesbury White.

(d) County of Cumberland.

Early Sowing.—Hickory King, Wellingrove, Golden Superb.

Main Sowing.—Fitzroy.

SOUTH COAST.

(a) Illawarra District.

Early Sowing.—Funk's Yellow Dent, Iowa Silvermine.

Main Sowing.—Large Red Hogan, Fitzroy, Yellow Hogan, Giant White.

(b) Shoalhaven River.

Early Sowing.—Golden Superb, Iowa Silvermine.

Main Sowing.—Leaming, Hickory King, Giant White, Fitzroy.

(c) Milton District.

Early Sowing.—Funk's Yellow Dent, Iowa Silvermine, Duncan.

Main Sowing.—Fitzroy, Leaming, Hickory King, Golden Nugget.

(d) Moruya River.

Early Sowing.—Golden Superb, Early Morn.

Main Sowing.—Leaming, Funk's Yellow Dent, Golden Superb, Hickory King, Giant White.

(e) Bodalla District.

Early Sowing.—Golden Superb.

Main Sowing.—Funk's Yellow Dent, Golden Nugget, Hickory King.

Upland Soil.—Hickory King.

(f) Bega and Pambula Rivers.

Early Sowing.—Early Morn, Golden Superb.

Main Sowing.—Funk's Yellow Dent, Leaming, Giant White.

Upland Soils.—Hickory King.

(*g*) *Towamba River.*

Main Sowing.—Golden Superb, Golden Nugget, Leaming, Hickory King, Funk's Yellow Dent.

Upland Soils.—Hickory King.

NORTHERN TABLELAND.

(*a*) *Tenterfield District.*

Hickory King, Wellingrove, Large Goldmine, Iowa Silvermine.

(*b*) *Glen Innes District.*

Strong Soils.—Wellingrove.

Light Soils.—Iowa Silvermine, Large Goldmine, Golden Superb.

(*c*) *Ben Lomond, Llangothlin, Guyra, and Black Mountain Districts.*

Golden Glow.

(d) *Armidale District.*

Wellingrove, Large Goldmine, Golden Glow, Early Morn.

(*e*) *Uralla District.*

Hickory King, Large Goldmine, Wellingrove, Golden Glow, Early Morn.

CENTRAL TABLELAND.

(*a*) *Mudgee District.*

Funk's Yellow Dent, Leaming, Golden Superb, Hickory King.

(*b*) *Colder Districts* (*Orange, etc.*).

Early Morn. Golden Glow.

SOUTHERN TABLELAND.

Moss Vale District.

Golden Glow, Early Morn, Hickory King, Golden Superb.

NORTH-WESTERN SLOPES.

(*a*) *Inverell District.*

Heavy Soils.—Funk's Yellow Dent, Wellingrove.

Light Soils.—Wellingrove, Iowa Silvermine.

Late Sowing.—Early Morn, Golden Glow.

(*b*) *Tamworth and Upper Hunter Districts.*

Early Sowing.—Early Morn, Golden Glow.

Main Sowing.—Wellingrove, Funk's Yellow Dent, Golden Superb.

CENTRAL-WESTERN SLOPES.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Uplands Soils.—Iowa Silvermine.

SOUTH-WESTERN SLOPES.

(*a*) *Tumut District.*

Main Sowings.—Murrumbidgee White, Funk's Yellow Dent, Iowa Silvermine, Golden Superb.

(*b*) *Gundagai District.*

Funk's Yellow Dent, Murrumbidgee White, Golden Glow, Golden Superb.

MURRUMBIDGEE IRRIGATION AREA.

Funk's Yellow Dent, Fitzroy, Hickory King, Iowa Silvermine.

Varieties Recommended for Green Fodder and Silage.

UPPER NORTH COAST.

Fitzroy, Hickory King (second-class soils only).

DORRIGO DISTRICT.

Leaming, Iowa Silvermine.

MIDDLE NORTH COAST.

Fitzroy, Hickory King (second-class soils only), Golden Nugget, Leaming, Golden Beauty.

CENTRAL COAST.

Fitzroy, Golden Nugget, Hickory King, Iowa Silvermine.

SOUTH COAST.

(*a*) *Illawarra District.*

Fitzroy, Pride of Hawkesbury, Hickory King, Golden Nugget.

(*b*) *Shoalhaven River.*

Fitzroy, Pride of Hawkesbury, Hickory King, Golden Nugget.

(*c*) *Milton District.*

Fitzroy, Duncan, Golden Nugget, Hickory King.

(*d*) *Moruya River.*

Fitzroy, Hickory King, Golden Nugget.

(*e*) *Bega and Pambula Rivers.*

Fitzroy, Hickory King, Bega Yellow, Giant White, Golden Nugget.

NORTHERN TABLELAND.

Wellingrove, Iowa Silvermine.

CENTRAL TABLELAND.

Funk's Yellow Dent, Iowa Silvermine.

SOUTHERN TABLELAND.

Moss Vale District.

Hickory King, Fitzroy.

WESTERN AND SOUTHERN SLOPES.

Funk's Yellow Dent, Murrumbidgee White.

Supply of Cornsacks for Coming Wheat Harvest.

The Minister for Agriculture (Hon. E. H. Graham, M.L.A.) has received the following communication regarding supplies of cornsacks for the coming wheat harvest from the General Manager of the Australian Wheat Board, which acts on behalf of the Commonwealth Government in the purchase of cornsacks overseas:—

"The prospective cornsack stock position for growers' requirements in your State next season (1948-49) is as follows:—

	Bales.
Present stocks	25,000
On water	4,000
Stocks expected at end July	29,000
Shipments to arrive by end October	14,000
Total anticipated supplies at end October	43,000

"To supplement the supplies shown above, shipments will be arriving regularly after October. No difficulty, therefore, should be experienced by growers in securing their full requirements as and when they require them, provided, of course, there are no hold-ups in shipments from India through circumstances beyond our control."

Discussing this statement Mr. Graham said that he was carefully watching the interests of wheat-growers in this State for the coming harvest and had been in constant touch on their behalf with the Commonwealth authorities concerning the question of adequate supplies of cornsacks for the receival and storage of the crop.

"I will continue to watch the position very carefully," added Mr. Graham, "and I would like to assure New South Wales growers that so far as the State Government is concerned everything possible is being done to ensure that an efficient organisation is ready to handle this year's wheat crop."

Value of Soil Analysis to the Fruitgrower.

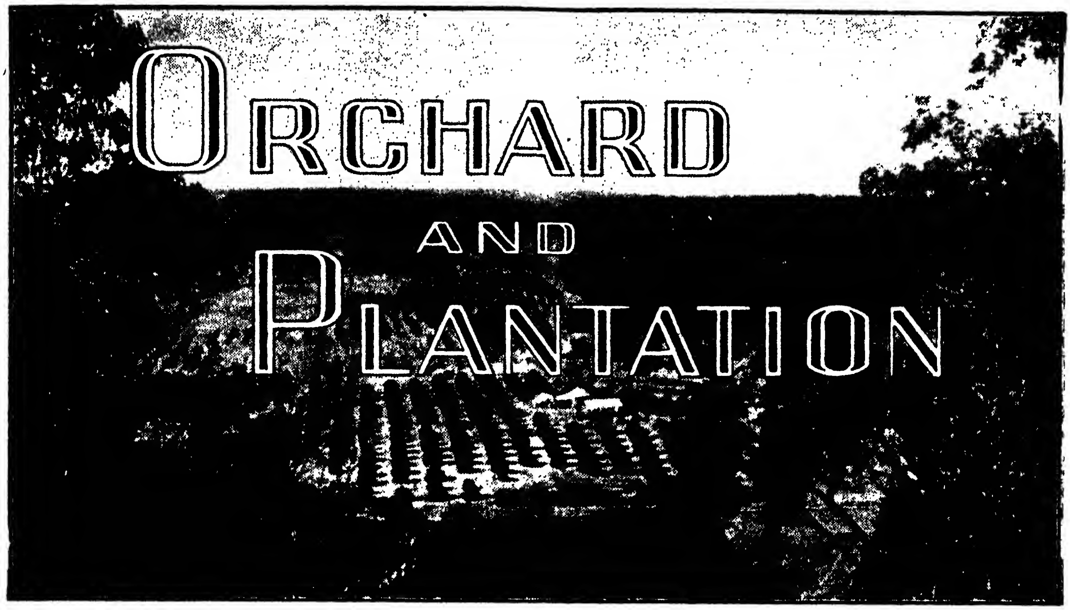
FREQUENTLY samples of soil are submitted for an analysis as to their suitability for certain kinds of fruit production and for direction as to what fertilisers should be used. The samples vary in size from match box volume to several pounds weight. As a rule such a request cannot serve a very practical use.

The suitability of soil for any agricultural purpose is dependent to a greater degree on its physical characteristics and topographical location than it is on the amounts or kinds of nutrients present. This is well illustrated by a soil sample taken from a swamp area which would probably analyse as being very "rich" in nutrients, but because of a lack in drainage, trees could not succeed in that environment. Similarly, a sample of very finely ground brick, even if analysis revealed a satisfactory level of fertility present, would prove useless for production of the usual kinds of fruit trees because of unavailability of the nutrients and its unfavourable structure.

Occasionally it is observed that apparently very infertile soils produce plants that are quite luxuriant and productive—for the reason that what little plant food is present is readily available for use. That very important fact can only readily be determined by growing plants.

It is difficult to obtain a soil sample that is strictly representative of an area of land. The effects of the least irregularity in soil type and the amount and kind of vegetation growing on land cause marked differences in analysis of soil samples. If these irregularities are further accentuated by irregular applications of lime, fertiliser, the debris from fires, etc., the soil sample is still less likely to be a representative one and the data of doubtful value.

Where a grower is unable to produce satisfactory crops and in the absence of any obvious reasons for these results, an analysis of a soil sample may prove helpful. In such case, samples of soil should be obtained from several parts of the field. They should be about equal in quantity and taken to a similar depth, and should be thoroughly mixed together. From this composite a fairly representative sample could be obtained.



DEVELOPMENT OF YOUNG CITRUS GROVES.

Sound Management in Early Years

IS VITAL TO SUCCESS.

◆

R. G. KEBBY, Special Fruit Officer.

The percentage of young trees in the citrus orchards of New South Wales is perhaps at a higher level than ever before, and fresh plantings are still being maintained at a high rate. The future of the industry depends to an appreciable extent on the development of these non-bearing trees of to-day.

It is a disconcerting fact that upwards of 30 per cent. of the young citrus plantings in New South Wales is being lost each year through disease and faulty management. While this represents a serious cash loss in the initial outlay there is, in addition, the cost of replacements, and the loss of years in the establishment period. The industry need not and should not carry this additional cost.

Those years from propagation to commercial bearing are vital in moulding trees that will be capable of maximum production. Too much attention cannot be given to tree management during this period, as growth checks sustained then are never really overcome during the life of the tree.

The following points are made in the hope that those charged with the responsibility of producing and developing the groves of to-morrow will check up on their present methods and put right those things which may not be receiving proper attention.

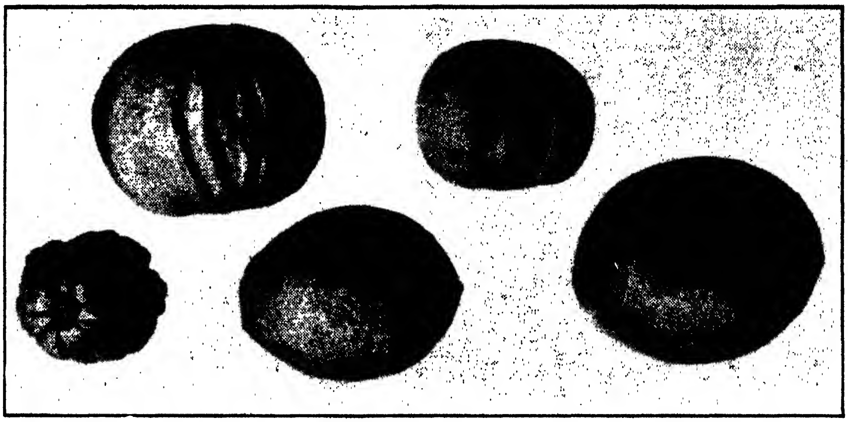
The first important stages in the life of the young tree begin in the nursery and points for careful consideration are:—

(*a*) Completely eliminate from the seed-bed all seedlings affected with root rot (Phytophthora).

(*b*) Maintain control over pests and diseases in the seed-bed.

(*c*) Select the best seedlings for transplanting—aim at vigour all the time.

(*d*) Use only selected buds from parent trees of proved performance—utilise the



Mutations Produced by a Valencia Tree of Inferior Strain.

services of the Co-operative Bud Selection Society in this regard.

(*c*) Keep the growth moving from cutting-back time onwards.

There has been an increasing tendency towards the production of smaller trees to facilitate bundling and reduce handling charges. This has meant a growth check in the first critical year and an unfair initial handicap for the grower.

Lifting and Despatch.

It is an established fact that if the fibrous roots of citrus trees are exposed to the air and sun for even very short periods they will die, and young trees so affected will take much longer to establish in the grove—if they survive the ordeal.

Well-grown Yearling Citrus Trees.

Trees should not be lifted during very hot or windy conditions, and they should not be lifted from dry soil. Reject any tree with root-rot or seriously malformed root systems.

Special arrangements should be made to ensure that the trees are puddled *within minutes* of lifting, even under the best conditions. Complete and effective covering must be provided during transport from nursery to packing shed and in the packing shed itself. Packing material should be clean and well moistened and containers strongly constructed with complete coverage of foliage.

The nurseryman should give the grower as much notice as possible ahead of despatch.

Preparations for Planting.

The grower, in turn, should be prepared to go right ahead with planting when his trees arrive. We see far too many instances in which trees have to be heeled in, awaiting final preparation of the block. This means additional handling, exposure and injury of the root system.

The block should be smoothed (under irrigation) or harrowed down, and the planting pegs in position *before the trees arrive*.

Planting the Trees.

Holes should be dug just ahead of the planters so that the soil does not dry out. It is only necessary to make the hole of sufficient size to take the root system; 18 inches in diameter by 8 to 10 inches deep

is usually adequate. The addition of a shovelful of well-rotted compost or a handful of blood and bone will help a lot in the light, sandy soils.

The planting operation should be carried out speedily and with care. It is a mistake to attempt to plant direct from the bundle. A barrel half-full of water, mounted on a slide, will hold a couple of rows of trees at a time and serves to wash off the clay "puddle" applied to the roots in the nursery and at the same time protect against drying out.

Examine the roots quickly for disease and clean up any mechanical injury that has occurred, rejecting any trees with root-rot or seriously malformed root systems.

Place the tree in position and *spread the roots.* This is important because very often the root system is closed up due to tight packaging, and unless spread out will not develop according to its original and natural tendency in the nursery. Work in light soil among the roots by hand, and avoid clods. When about three-parts filled in, tramp the soil around the tree lightly but firmly. This will help to expel air pockets and consolidate the tree in position. Top off with light soil and provide a small basin that will hold a bucket of water right away. This job of "watering in" cannot be left until to-morrow, even if weather conditions are ideal.

It is important that the trees be not planted any deeper than they were in the nursery and in shallow soils where top-dressing is practised, they should be planted even shallower. This will ensure that the "bud union" is well above ground level and so guard against possible soil infections at that point.

After Care is Important.

When a tree is lifted from the nursery, a percentage of the root system is left behind so that a compensating reduction of top growth is necessary when replanting. This is achieved by cutting back lateral growths and reduction of larger leaves by cutting through them.

Protection against sunburn should be provided by wrapping the trunk with paper, hessian or other covering materials from ground level to the crown if formed, or to within about 6 inches of the top if the tree is a "whipstick."

Where irrigation is available, subsequent waterings should be made "according to the soil auger," and under no circumstances should the trees be allowed to reach wilting point. Under other conditions, the water cart must be working ahead of wilting point.

Weed growth is the most serious competitor for soil moisture, and during the early years the hoe is still the best implement for control—despite popular aversions to it and attempts to develop mechanical substitutes.

Stocks for Citrus.

CITRUS varieties are usually propagated by means of budding, using buds taken from the desired variety and inserting into stocks (seedlings) of suitable kinds.

Young Citrus Trees, showing Rows Contoured to Minimise Erosion of Soil.

Years of research and experience have shown that the selection of suitable stocks for the different kinds and varieties of citrus is highly important, and while general recommendations can be made with confidence, the whole question of citrus stocks will continue to be a wide and interesting field of investigation while ever citrus is grown.

The present position in regard to citrus stocks may be briefly discussed as follows:—

Rough Lemon has proved itself a satisfactory stock for nearly all varieties of citrus, and has been the stock most generally in use until quite recent years. The serious depredations of Phytophthora root rot under conditions favourable to its development, have rather restricted the scope for this stock, which is susceptible to this disease. New South Wales growers have swung over largely to *Trifoliata* for certain varieties such as Valencia orange, grapefruit and the mandarin.

It should not be thought, however, that rough lemon has been thrown completely into the discard, because when certain

requirements can be met, this stock will still command a very important position in our citrus industry. These requirements may be stated simply as follows:—

Availability of

(*a*) Disease-free trees from the nursery;

(*b*) new citrus land for the intended planting;

(*c*) intelligent maintenance of the soil moisture condition, and particularly avoiding excesses of water.

Sweet Orange is quite a satisfactory stock for oranges, grapefruit and lemons, and is particularly adaptable to the deeper soils on account of its deep-rooting habit.

Poncirus trifoliata has, in recent years, established itself in New South Wales as a stock of considerable merit for use with Valencias, mandarins and grapefruit. Of special importance is its obvious and beneficial influence on fruit quality together with an immunity to the attack of Phytophthora root rot.

Some criticism has been made of this stock in the past for its alleged dwarfing influence on citrus varieties. Departmental research has shown that dwarfing does occur to some extent with Washington navels and also to a lesser extent with grapefruit. However, this dwarfing is confined to individual trees and is not a general effect on all trees. Where dwarfing does occur, it is invariably associated with a scaling of the bark, known as "scaly butt," at the bud union. While in most cases the percentage of affected trees may not be serious, the proportion is still rather too variable for *P. trifoliata* to receive a full recommendation for navels. The Department is continuing a large-scale research programme into the problem of scaly butt and the possible evolution of a strain of *trifoliata* which will prove completely satisfactory for navels. This stock is quite unsatisfactory for lemon varieties.

Sour Orange.—While this stock has enjoyed some success in other parts of the world and in certain States of the Commonwealth, this Department has never recommended it for general use. In all citrus stock trials conducted by the Department, it has proved a complete failure with all varieties excepting Eureka and Lisbon lemons. In fact, it has not been possible to establish trees up to commercial cropping, and in most instances the trees have been discarded in the first to fourth years of growth.

Recent experiences of quick decline or disease in other countries (South Africa, Brazil and California) indicate that this serious problem is wholly confined to sweet orange varieties worked on sour orange stock. From this point of view we may consider ourselves fortunate that sour orange stock was eliminated from commercial plantings at an early stage in the history of the industry in New South Wales.

Disease Attacks Bathurst Burr.

BATHURST burrs thickly infesting approximately 200 acres of country at Merriwa are infested with disease. In certain places all burrs are dead or dying, and over the remainder of the area 50 to 80 per cent. of the plants are infected. Reduction in seed production in this area is estimated at 80 to 90 per cent.

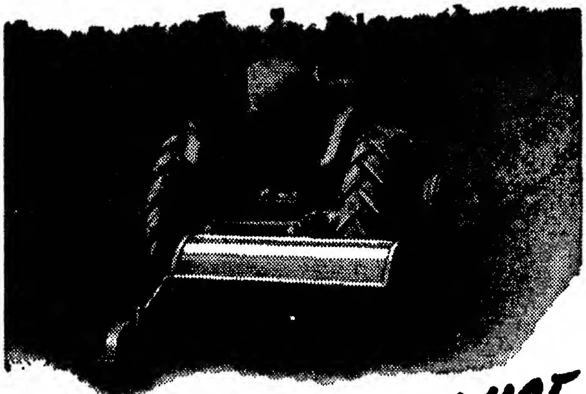
Burrs have also been infected in less thickly infested areas, but to a lesser extent.

A field study made at Merriwa indicates that the parasitic fungus primarily responsible is a species of *Colletotrichum* which causes extensive black stem lesions and ultimate stem ringbarking. The effect of infection is to kill the plant and to suppress seed production. Later another fungus, *Rhizoctonia*, causes a root rot condition but this appears to be secondary to the initial infection and killing of the plants by the first organism.

In general, parasitic fungi are confined in their attacks to specific plants, so that it would be possible for a highly virulent pathogen of a specific weed to be encouraged without threat to other fodder and grazing plants.

Outbreaks of disease in weeds are always of great interest to landowners and graziers because of the belief that such disease might be employed in helping to control weeds. The prospects of biological control of weeds by parasitic fungi, however, are not bright because such outbreaks are usually closely dependent upon special, and often unusual weather conditions for development.

In spite of this, the great losses caused by the burr weeds in this State demand examination of any possible means of control, and a full examination is to be made of conditions of temperature and humidity which brought about the disease outbreak in Bathurst burr this year.—BIOLOGICAL BRANCH.



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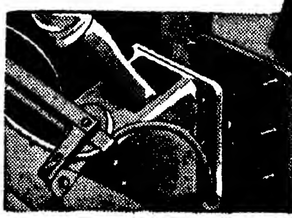

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A NEW CITRUS RESEARCH STATION

To Be Established at Coomealla

TO SERVE MURRAY VALLEY SETTLEMENTS.

A RESEARCH Station to investigate all aspects of citrus fruit culture in the Murray Valley is to be established at Coomealla by the State Government.

When making this announcement, Hon. E. H. Graham, M.L.A., said: "In view of the importance of the citrus industry on the River Murray it is my desire to give growers in that area the assistance of the latest scientific knowledge to enable them to deal with problems resulting from disease, loss of soil fertility and other matters affecting their industry.

"During my term as State Minister for Agriculture, research projects have been established in various localities throughout the State, including the citrus growing areas on the coast, in accordance with my policy of decentralising research into agricultural problems generally."

Mr. Graham said that the site selected for the Coomealla Research Station was located immediately between the Curlwaa and Coomealla Irrigation Settlements. It was proposed to conduct investigations into all problems associated with the production of citrus fruits in the Murray Valley and to carry out testing of other horticultural crops which might be of economic importance to the area.

The Research Station would also serve as a centre for educational work among the Murray Valley Settlements. It was being established at a most opportune time as the extensions of the Coomealla Irrigation Area for a Returned Soldiers' Settlement would be effected in the near future.

The Council for Scientific and Industrial Research had offered to collaborate with the work of this Station by making available the services of officers and laboratory facilities at the Merbein Viticultural Research Station in Victoria, situated about 18 miles from the Coomealla project.

Mr. Graham added that an Advisory Committee comprising representatives of the New South Wales Department of Agriculture, Council for Scientific and Industrial Research, the Victorian Department of Agriculture and growers' organisations would be set up to assist in the development of research work.

Group taken on the Site of Coomealla Research Station.
With Hon. E. H. Graham, M.L.A. (centre) are representatives of growers' organisations and officials.
[*Photo by C. G. Savage.*

QUICK FREEZING OF FRUITS AND VEGETABLES In U.S.A. and Canada.

(*Continued from page* 431.)

S. M. SYKES, B.Sc.Agr., Fruit Officer (Research).

Mr. Sykes returned to Australia early this year from an investigation of quick freezing methods in the United States of America and Canada. In previous sections of this article—in which he is describing his outstanding observations—he has discussed recent technical developments in the industry and methods of handling various fruits and vegetables during the freezing process.

This month's instalment is devoted to the growing of vegetable crops for freezing, with particular reference to the influence of the quality of the raw material on the finished product.

The Quality of Raw Material.

The quality of the raw material, when it is delivered to the processor, is one of the main factors determining whether the final quality of the frozen article is to be good or bad. Processors are coming more and more to the point of view that, in the production of quality frozen foods, the emphasis must be placed on the field side rather than the processing side of the operation. Quality control in the plant must obviously be continued and, in many cases, improved. But, too often, a highly organised and controlled plant finds that its work is futile because of failure on the part of the field organisation to deliver a product grown under the best available conditions, harvested at the correct maturity and promptly landed at the plant.

Growing of Vegetables for Freezing.

Whatever type of grower-processor agreement is made, it is absolutely necessary for the freezing plant to have adequate control over the cultural and harvesting operations. Many plants in the United States of America have their own farms, but probably the greater portion of vegetables for freezing is grown by contract and the grower paid on the basis of the weight and quality produced. This system works well where there is no fresh market competition, but some modification is sometimes necessary in order to compensate the grower for possible losses incurred by growing for processing instead of for fresh market. Most plants are located in growing areas where large fresh markets are not available or where the market is small compared with the growing capacity.

The growing of vegetables for freezing is similar to the growing of canning crops, except that different varieties are used and harvesting may be carried out at slightly different maturities.

Many plants have found it necessary to give special attention to cultural matters such as insect and disease control, irrigation practice and fertilizer applications. The field control of insects in broccoli and the use of boron to prevent brown discolouration in cauliflower are examples of the very close relationship between growing and processing.

Careful planning of the planting of vegetables for freezing is essential. The plantings are arranged with the object of giving as wide a spread in maturity as possible, so that plant capacity will not be overloaded. By the use of early and late varieties, different planting dates, growing areas of different climate and elevation, the harvesting of a particular crop can be planned according to the capacity of the processing plant.

The Harvesting and Handling of Vegetables for Freezing.

The best maturity for vegetables intended for freezing is usuallv near that for fresh consumption. The object is to have the frozen product as near as possible in flavour, appearance, etc., to the fresh.

Quality-conscious plants in America are devoting a large proportion of their staff, finances and research to the control of the

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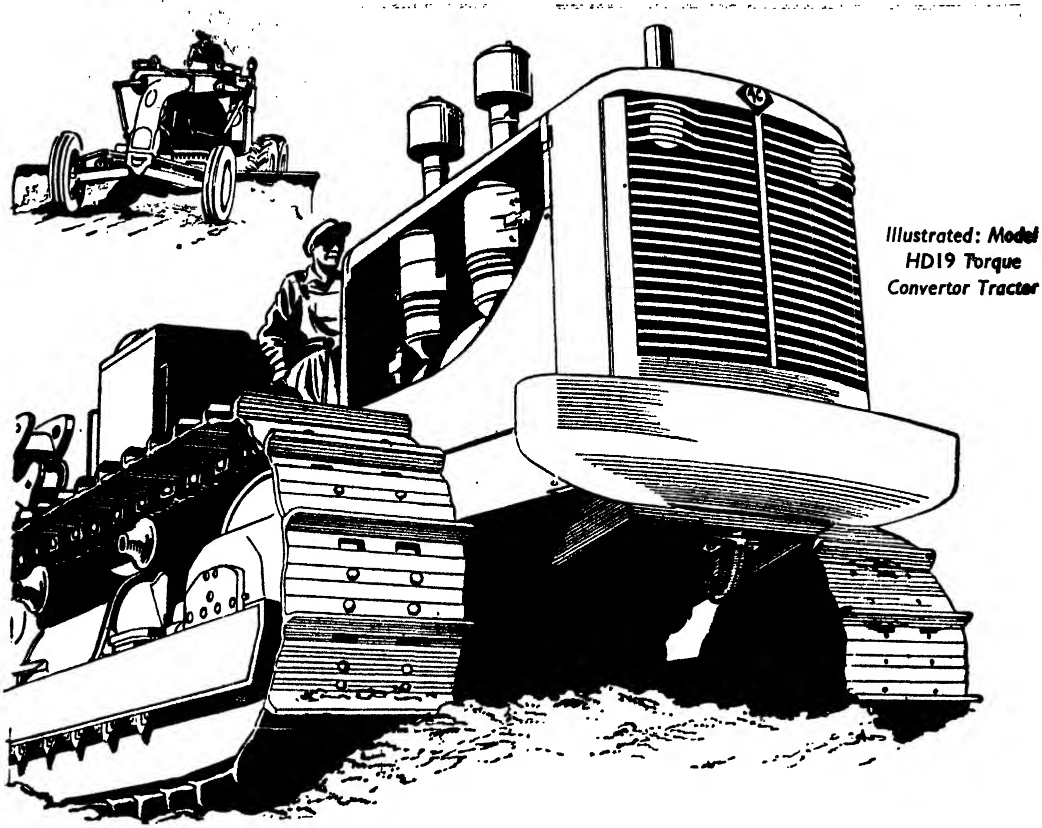

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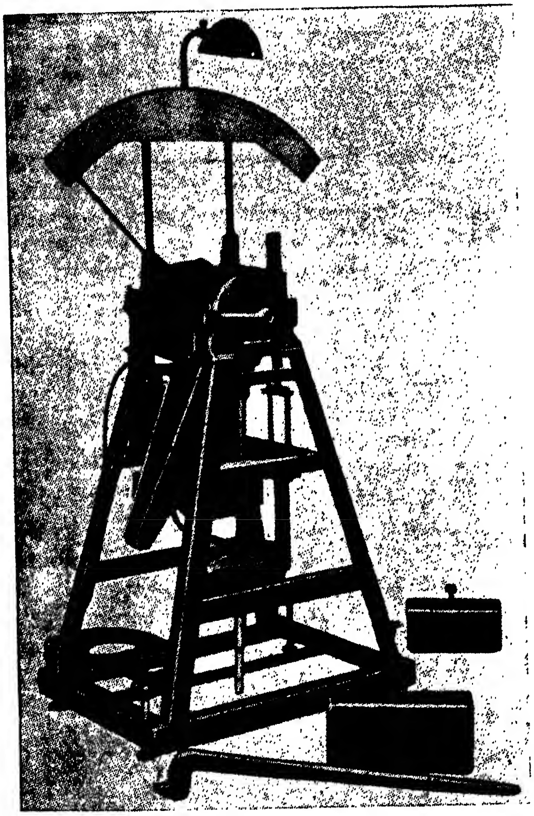
maturity factor. When it is realised that a day's delay in harvesting might cause a loss of thousands of dollars in the quality of the final article, the reason for the emphasis on maturity control will be seen. Research on the prediction and determination of maturity is given special attention by large freezing companies, experiment stations and other agencies. New instruments like the "tenderometer" and "succulometer" as well as



The Tenderometer—used for Measuring the Toughness of Peas.
Courtesy of Food Machinery Corp.

numerous laboratory tests have been developed for the purpose of gaining more control over the maturity factor.

The following are some brief notes on the determination of maturity, harvesting and handling of the main vegetables before processing.

Peas.—The harvesting date of peas is determined on the basis of (*a*) planting date and a knowledge of the maturity period for each particular variety; (*b*) observations of field officers. Visual observations of vine, pod and seed by experienced men can give a fairly accurate estimate of best time for harvest. Field officers also use objective tests, such as tenderometer readings. Peas should be sweet, full flavoured, and firm but not tough.

The pea vines are cut with mechanical swathers and loaded on to trucks by elevators. The vines are then put through the viners and the loose peas collected in lug boxes. Vines should preferably not be held before threshing. If they must be held, they should be spread out to prevent heating.

The handling of shelled peas from viner to plant must be organised to give a minimum of deterioration. Where viners are not far from the plant, it is probably not necessary to cool the peas. Where a long haul is involved, peas are cooled in cold (sometimes refrigerated) water and a layer of crushed ice is placed on top of the peas in lug boxes. The disadvantage with cooling is that leaching and the proportion of split peas is increased.

Opinions vary as to the distance of transport which can safely be undertaken without pre-cooling and icing. In one plant, a haul of sixty-five miles (about two hours) was considered safe without icing. Some large plants have elaborate pre-cooling and storage facilities whereby peas on arrival at the plant are put through refrigerated flumes and stored at 32 deg. Fahr. in large bins for periods up to twenty-four hours. The peas should be in good condition for pre-cooling.

Snap Beans.—Beans should be harvested in an immature condition when they are still tender and free from fibre. The colour and hardness of the seeds is often used as an index of maturity by the experienced grower or field man.

Snap beans are picked by hand into baskets and transferred to open-mesh bags or crates. A mechanical picker is being developed but it is not, so far, in commercial use. The beans may be held for a day or two at 40 deg. Fahr. provided they are spread out to prevent sweating. Varieties of beans differ in their ability to retain their freshness during cool storage.

Sweet Corn.—There is no universally adopted procedure for determining the maturity of sweet corn, but the subject is under investigation. The moisture content, refractive index and specific gravity have all been used. Mechanical methods (e.g., "tenderometer" or "texturemeter") have not been satisfactory. Corn should be harvested when the kernels have filled out, but are still sweet and succulent. Corn for frozen corn-on-the-cob should be slightly less mature than for whole-kernel corn. In general, corn for freezing should be less mature by one or two days than corn intended for canning.

Corn ears are hand-harvested at present, but a mechanical harvester is being tested and is giving very promising results.

Sweet corn may be held for periods of some hours if open wagons or open bins are used for storage. However, the loss of sugar is rapid and the less delay the better.

Broccoli.—The central heads of broccoli are removed well before harvesting. Side shoots are induced as a result. These are cut with a curved knife and packed, as shoots about 7 inches long, into baskets and later into lug boxes (as for asparagus). Cuts are made about every six days, and later, every ten days for a period of up to three months. The time of harvest depends on the condition of the heads, which should be fairly compact, free from shattering and flowering. Insect infestation should be checked just before each cutting. If the broccoli becomes badly infested, the heads must be cut, discarded and the whole crop dusted. The next crop should then be free of insects.

After trucking to the plant, the broccoli should be processed immediately or held in cool storage at 35 to 40 deg. Fahr. It is frequently sprayed with cold water before processing to make it firmer for cutting and to check deterioration.

Brussels Sprouts.—This vegetable is harvested when the sprouts have reached the normal "fresh-market" size. These heads should be firm, compact and of good green colour. They are picked by hand and transported to the plant in boxes or baskets.

Cauliflower.—Cauliflower is hand harvested when the curds are a good size but are still compact. It should not be held for more than a few hours at ordinary temperatures because of discolouration and the tendency for the head to become loose. When storage is necessary, cauliflower should be held at about 40 deg. Fahr.

Asparagus.—Asparagus stalks are cut by hand when they are of a good green colour, succulent and tender. They are packed,

Freshly Cut Pea Vines being Fed to Mechanical Pea Viners in Washington, U.S.A.

[Courtesy of Birds Eye Frosted Foods.

head upwards, in boxes and transported to the plant. Where the journey takes more than about two hours, it is desirable to pre-cool the asparagus in the field. This can be done by the use of a machine which resembles a steam blancher. Ice and water are placed in a tank under the moving belt and the cool water is pumped through sprays or perforated tanks over the asparagus. Pre-cooled asparagus may be stored for several days at 32 to 34 deg. Fahr.

On arrival at the plant, asparagus which has not previously been pre-cooled, may be sprayed with cold water before processing.

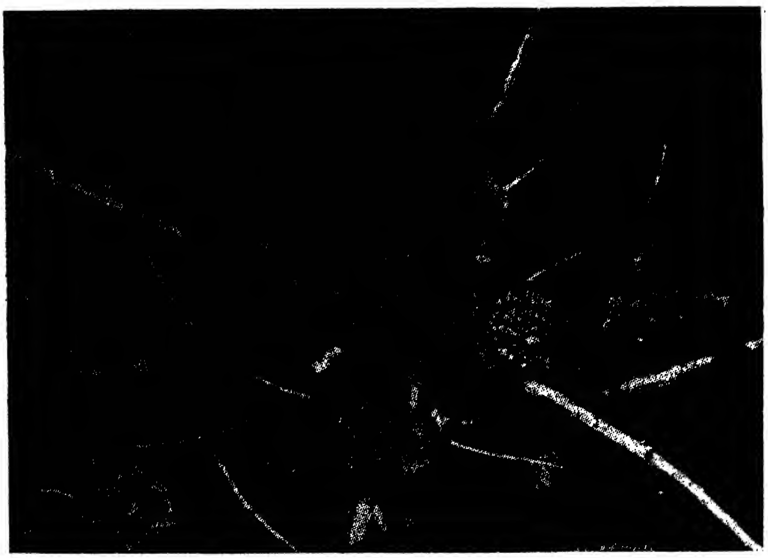
The Selection of Varieties for Freezing.

In the production of raw material for freezing, the climatic and soil suitability and the correct cultural techniques are of primary importance. The question of selecting the correct varieties must be considered at the same time.

Just as special varieties of vegetables have been developed for canning, it has been found that some varieties are more suited to freezing preservation than others. In general, varieties which give a good fresh-market product have been satisfactory for freezing. On the other hand, canning varieties are often unsuitable for freezing in that they have been developed to resist the severe heat processing of the canning operation. Freezing aims to give a product as close as possible to that of the fresh article; thus, it is to be expected that many established fresh-market varieties will be also adapted to freezing.

There are, however, special requirements for freezing varieties. They must, as far as possible, be suited to mechanical harvesting and threshing (where used), and to the various stages in preparation and freezing. Freezing brings about changes in texture and a variety should possess cellular properties which enable it to resist those changes.

For a crop like peas, the time to reach maturity will be obviously an important feature of the variety. A variety may be planted chiefly on account of its earliness or lateness in order to give the necessary spread in harvesting period.



Freezers' Green Broccoli—A Variety Specially Adapted to Freezing.
[*Courtesy Assoc. Seed Growers Inc.*

No matter how good a variety is in relation to freezing, it must also be satisfactory from the grower's point of view, *i.e.*, it must yield reasonably well, possess resistance to disease and, in general, do well in the particular locality in which it has to be grown.

The problem of selecting the best varieties must be investigated in relation to each particular district. A considerable amount of such work has been carried out in America by universities, experiment stations, processing plants and seed companies.

Some varieties have proved satisfactory under a wide range of climatic and soil conditions, while others have yielded a very good frozen product in one locality and a poor frozen product under other conditions.

Undesirable features of some frozen vegetables have been eliminated by the development of improved varieties, and it seems that future plant breeding and selection will play a big part in raising the quality of many products.

(*To be continued.*)

Windsor Longpod—A New French Bean.

Bred at Hawkesbury Agricultural College.

A NEW French bean, "Windsor Longpod," has been evolved at Hawkesbury Agricultural College by Mr. N. S. Shirlow. The advantages of this new variety are earliness, heavy production of long pods, and comparatively good resistance to disease.

Windsor Longpod is of the same breeding as Richmond Wonder, and is similar to that variety in type and length of pod. It is distinguished from Richmond Wonder by its earlier maturity, being ready for picking seven to ten days before that variety.

Details of Windsor Longpod are:—

Plants.—Large, without runners, vigorous, hardy, and heavily productive. Stems stout, foliage abundant, dark green, leaflets large, flowers lilac. Early maturing.

Pods.—Borne amongst the foliage, fleshy but with fairly heavy string and fibre with age. Shape long, straight oval in cross section. Length, 9 inches to 10 inches, containing six to seven seeds per pod. Colour, medium to dark green. Point of pod straight to slightly curved.

Seeds.—Large, long, straight to slightly curved. Almost round in cross section; straight at hilum. Colour, reddish plum with a narrow dark eye ring.

A Typical Plant of Windsor Longpod Bean.

Seed of this new variety is being increased and limited supplies should be available next year.

Book Reviews.

NEW BOOKS ON BACTERIOLOGY.

Fundamental Principles of Bacteriology, by A. J. SALLE. Third Edition, 1948.

This modern textbook of 730 pages is designed to give the student a solid foundation for more advanced work on the subject. Great emphasis is rightly placed on the chemistry underlying the methods of study and the reactions produced by bacteria, enabling a fundamental approach to an understanding of these important micro-organisms and their activities.

The book is refreshingly up-to-date and much modern work such as that on antibiotics, the electron microscope and bacteriophages, has been included or references to it given. Illustrations are excellent and the production of the book is consistent with the usual high standards of the publishers.

Laboratory Manual on Fundamental Principles of Bacteriology, by A. J. SALLE. Third Edition, 1948.

This manual has been written as a companion to the textbook on Fundamental Principles of Bacteriology, by the same author, and provides a series of well-arranged exercises for the laboratory training of students in general bacteriology.

A feature of each exercise is the brief explanatory introduction which assists in maintaining orientation when proceeding from one subject to the next. A useful set of quiz questions is provided with each exercise.

Our copies from the publishers, McGraw-Hill Book Co., New York, U.S.A.

—*Reviews by Dr. C. J. Magee.*

CELERY PRODUCTION ON THE MURRUMBIDGEE IRRIGATION AREA.

Investigational Work at Leeton Experiment Farm.

C. E. PURDUE, Agronomist.

FOLLOWING investigations by the Department in co-operation with growers it was known several years ago that celery could be grown on the Murrumbidgee Irrigation Area; the results from several privately-grown crops have been very successful.

It was with the idea of establishing the correct methods of production of the crop that extensive trials were carried out last season on the Leeton Experiment Farm.

Time of Sowing.

One of the problems encountered on the Area is that irrigation water—an essential requirement of the growing crop—is not available to the farmer after the end of April. To overcome this difficulty, it was necessary to find out the time of sowing which would best fit the crop into the growing period available.

Seed was therefore sown on three dates, viz., 19th September, 8th October, and 4th November. These sowings enabled plants to be set out in the field about 21st December, 8th January and 18th January respectively—approximately three months from sowing.

These trials showed that the early crop (planted mid-September) gave excellent results, and that the crop matured well within the limits imposed by the discontinuance of the irrigation water supplies—although special attention had to be paid to thorough seed-bed technique. Sowing in November is considered to be too late for commercial production on the Area.

Fertilizer.

Celery responds very readily to the application of a large amount of fertilizer. For the base dressing, 5 cwt. of a mixture of three parts superphosphate and one part sulphate of ammonia was applied in the trials, being drilled into hills spaced at three feet apart. Well-grown young plants were planted into the centres of these hills with a spacing of approximately eight inches between each plant.

Sulphate of ammonia applied as a side dressing during the period of most vigorous growth seems to be necessary for maximum production with this crop.

Accordingly, a side dressing of equal parts of superphosphate and sulphate of ammonia at the rate of 2½ cwt. per acre was given five weeks after transplanting, and later, two dressings of sulphate of ammonia at 2 cwt. per acre were given—one two months after transplanting and the other three weeks later.

Watering.

Intensive watering was carried out during the latter part of the growing period—when the crop draws heavily on the soil moisture. It was found that it was necessary to water at approximately five-day intervals on the heavy, self-mulching river

South Australian Giant White Celery Growing at Leeton Experiment Farm.
Blanching paper has been removed from one side.

soil on which the experiment crop was grown, and it is considered that on the lighter, less retensive soils, watering at intervals of three days would possibly be necessary.

Harvesting.

Production in this Area can be carried out for either processing purposes as used by the local cannery, or for market requirements; each requires a different handling technique.

For processing purposes the crop is harvested by the plants being cut at the intersection of the crown and roots. This is easily done by using a heavy spade well sharpened on the cutting edge, one strong blow being required to sever each plant. Any surplus root growth, over-mature stem or damaged leaf growth is removed, the resultant product being shipped direct to the cannery from the farm loosely packed in crates.

The marketed product requires to be blanched. This operation entails a little more handling. The most attractive product commanding the highest price on the market is a well blanched head. Blanching must be done in the field under our present conditions. It was found that a satisfactory material was strips of sisalkraft stood on edge along each side of the row and held in position with No. 8 gauge wire "bows" or clips, leaving a distance of 4 inches with the celery between the two strips.

Tests, using widths of paper ranging from 9 inches to 30 inches, proved conclusively that the wider paper produces the most acceptable product. Possibly an 18 to 24 inch strip, according to the height of the plants, would be most suitable. Good quality blanching paper and bows can be used for several seasons.

Varieties.

Six varieties of celery were tested in this trial. Those giving the most promising results were the South Australian varieties, such as South Australian White and South Australian Golden Plume. The variety Solid White also gave good results but varieties such as Golden Self Blanching cannot be recommended.

Importation of Aberdeen Angus Heifer "Elaine 4th of Dalmeny."

BREEDERS of Aberdeen Angus cattle will be interested to learn of the arrival in Sydney of an outstanding Aberdeen Angus heifer—"Elaine 4th of Dalmeny," purchased for the Department of Agriculture.

In making this announcement the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that "Elaine 4th of Dalmeny" was bred by the Earl of Rosebery at Dalmeny Stud, Edinburgh. Her sire is the well-known "Baron Brahma"—considered to be the best breeding sire at the Dalmeny Stud. "Baron Brahma's" sire is "Euripides of Balfron" and dam, "Eiraine of Dalmeny," an Enchantress Erica cow.

Mr. Graham said that arrangements for the purchase of "Elaine 4th of Dalmeny" were made by the Stud Stock Delegation, which he led abroad towards the end of 1946. "Elaine 4th of Dalmeny" was a splendid type of Aberdeen Angus heifer and would be an acquisition to the Department's Trangie Stud which already included the Aberdeen Angus bull, "Erison of Harviestoun," one of the outstanding animals of his breed in the British Empire to-day.

Junior Farmers Plant Trees—State Championship Results.

JUNIOR FARMERS are giving a lead in the planting of trees on farms. The four finalists in the Tree Planting State Championship recently conducted by the Junior Farmers' Club State State Council, grew from seed 3,000 trees, and planted them out in shade and shelter belts, wood lots and in fodder groves.

The varieties chosen—sugar gum, kurrajong and yellow and white box—were suited to the finalists' districts and were raised from seed collected from local trees. The planting scheme adopted was a long-range one and each finalist had sufficient seedlings growing to supply next year's plantings. Seeds were sown sparingly in jam tins and the seedlings thinned out to one plant after germination. The trees remained in the tins until planting out.

The winners of this competition were: 1st, George Walker (Wattamondara); 2nd, Vernon Wolter (Munyable); 3rd, William Stewart (Young); and 4th, James Stephenson (West Wyalong). The winner received a handsome cup donated by the Bank of New South Wales and a State J.F.C. Council Certificate. The lads who came second and third each received a State Council Certificate.

THE

BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics.

FARM BUDGETING.

PLANNING for the future is as important in farming as it is in any other type of business. The successful city businessman does not leave things to chance; he does not adopt a particular production programme for the year simply because he did the same thing the year before! He looks at his markets, his resources and his costs, and he decides on that programme of production which he anticipates will return him the greatest profit. Why should the farmer not do the same thing?

By the very nature of his work, every farmer, often perhaps without realising it, does, in fact, plan or prepare for the future. Frequently, however, no thought is given to definite planning, the farmer simply doing what was done in the previous season without paying any real regard to the fact that circumstances may have changed—and without making any attempt to ascertain whether the programme adopted in the previous season yielded the highest possible profit, having regard to the circumstances and to the amount of work and effort the farmer was prepared to expend. Often when plans are made they are not put on paper, nor are they carefully considered. Their preparation is, in fact, frequently far too haphazard to be sound.

There is no necessity for the planning of future farm operations to be either haphazard or unmethodical. A simple method is available whereby the farmer can plan for the future, either for the forthcoming year only or for a much longer period ahead. This method or technique is known as "Farm Budgeting."

In this article it is intended to discuss the farm budget, its advantages and uses, and in a further article, next month, to deal with the actual preparation of a typical budget.

What Is a Budget?

A budget is simply an estimate of probable receipts and expected expenditure in a future period. That period may be three months, or a year, or five years; however, the most common period for which a budget, whether a farm budget or any other type of budget is prepared is for a period of twelve months.

Why Prepare a Budget?

A businessman periodically prepares, for his own use, a statement of probable receipts and expenditure, which will vary according to the production programme he decides upon, and he uses such a statement to ascertain the programme he should adopt so as to obtain the greatest possible profit during the period for which he is planning. In

exactly the same way a farmer may put down on paper his anticipated receipts and expenses under various programmes or systems of farming, with the object of ascertaining which particular system of farming or combination of enterprises is likely to yield the greatest net profit under the circumstances which he anticipates will exist for a period of twelve months ahead, and in some cases for a longer period.

The preparation of a farm budget also enables the farmer to estimate in advance the returns that may reasonably be expected from any system of farming, under changed circumstances—and conditions affecting farm costs and returns are continually changing.

Any budget is necessarily of a tentative nature and this applies to the businessman's budget just as much as it applies to a farm budget. Many farmers think that, because of the uncertainty which surrounds some of the factors used in the preparation of a farm budget, it is not worthwhile putting future programmes on paper. The fact remains that budgeting does enable a farmer to see the value of alternate methods of organisation of production—and to decide which is *most likely* to prove the most profitable.

There are a number of other speeific advantages of farm budgeting. A budget helps a farmer:—

(1) To determine in advance how much seed, fertiliser and other supplies he is likely to need during the year.

(2) To determine how much feed will be needed for livestock, how much must be bought, how much may be expected to be produced on the farm, and how much is likely to be available for sale.

(3) To determine the amount of cash that will be needed to operate the farm, and also when it will be needed so that the necessary financial arrangements may be made.

(4) To determine the total net returns that may be expected, so that living expenses, payments or investments, may be adjusted accordingly.

(5) To keep a good balance between crops in a crop system of farming, and a good balance between crops and livestock in a crop and livestock system.

(6) To plan his labour requirements well in advance and, to a certain extent, it enables him to avoid unduly heavy casual labour requirements at any one particular period of time; in other words, the preparation of a budget may help to spread labour requirements more evenly throughout the year.

Farm budgeting is really a very simple process, and the few hours that need to be devoted to it each year are likely to be well spent; it is conceivable that, on some occasions, budgeting may save the farmer who takes the trouble to undertake the small amount of work involved, many hundreds of pounds.—P. C. DRUCE, Economics Research Officer.

FOOD LOSSES.

THE WORLD food crisis continues to be critical, and, in spite of the anticipated improvement in the European harvest, it is unlikely that any great relief can be expected in the immediate future. There are only two ways of increasing the supply of food—one is to step up production, and the other is to save food. Food can be saved by reducing consumption and by preventing loss.

While foodstuffs may be wasted in various ways, there is one extremely important source of preventable loss, viz., the activities of insects, mites, moulds and rodents. These agents work ceaselessly to destroy and contaminate food, and infestation may begin from many sources. Sometimes grain is infested by insects in the field before harvest; food stored in warehouses is always likely to become infested, either from residual insect population or by cross infestation from other sources; also food products may become infested during transport.

The Food and Agricultural Organisation of the United Nations (F.A.O.), has been giving attention to the extent of food losses due to infestation. The F.A.O. Expert Committee on destruction of food in storage is of the opinion that the annual loss in stored foodstuffs, brought about by insects, rodents and fungi, is enormous and

has estimated it to be approximately 10 per cent. of production for the entire world, or about 65,500,000 metric tons, which is approximately the amount which enters world trade annually. This food would be sufficient to supply a major part (1,600 calories) of the diet of 360,000,000 adult persons for one year.

In order to confirm the estimate of 10 per cent., a questionnaire was prepared and sent to all F.A.O. member countries in order to obtain data on losses sustained annually through infestation. Replies were received from twenty-seven countries, and the results were tabulated. The questionnaire was confined to the principal cereals—wheat, corn, rice, barley, oats and rye.

The total annual production, plus excess of imports over exports of the six grains in these countries from 1937 to 1940, inclusive, amounted to 323,923,900 metric tons. The total estimate of infestation losses was 25,750,000 metric tons, or just under 8 per cent. Some countries reported that serious farm storage losses existed, which could not be estimated. It seems certain, therefore, that if the unknown farm losses were added to the losses indicated by the questionnaire, the total would exceed 10 per cent. and confirm the estimate made by the F.A.O. Expert Committee.

The loss in the United States was estimated at 14 per cent., being made up as follows:—6 per cent for insects; 4 per cent. for fungi; 4 per cent. for rodents. It is likely that this estimate is too high, because it was not adjusted for different parts of the country and included grain and grain products condemned for human food under the strict regulations of the United States Food and Drug Act, but still available for livestock feed.

Since accurate figures are so difficult to obtain in a country like the United States, which is well supplied with technical staff, it is obvious that data from the rest of the world is very much of an estimated character. This applies particularly to many of the tropical and sub-tropical countries, some of which estimated losses of over 50 per cent.

If it is difficult to estimate the extent of losses caused, it is obviously still more difficult to estimate the loss which could be prevented by infestation control. F.A.O. believes that it should be possible by known methods to reduce these losses by from 50 to 75 per cent. At any rate it is reasonable to expect that a world-wide campaign should effect a very material saving in food.

In Australia only rough estimates have been made of the extent of food losses brought about by the agents mentioned. The loss in wheat and oats has been tentatively estimated at .1 per cent., and in maize at 2 per cent., although some people would put the loss in wheat as high as .4 per cent. to .5 per cent. Taking the estimate as .1 per cent. in the case of wheat and oats and 2 per cent. in the case of maize, in terms of physical quantities, the average yearly loss over a period of time would be 150,000 bushels of wheat, 17,000 bushels of oats and 130,000 bushels of maize. Due to the fairly extensive use of anti-infestation measures, losses here are relatively much smaller than those in most other countries.

The New South Wales State F.A.O. Committee has recently given consideration to the extent of food losses being caused by insects, mites, mould, fungi and rodents. On behalf of the Committee, the Department of Agriculture intends to make a survey for the purpose of ascertaining, in some detail, the extent of food losses in this State. A survey will be made of warehouses, mills, etc., and farms, to examine storage facilities and conditions and to form an opinion of the magnitude of the losses. Furthermore, it is intended to embark on a campaign of publicity in order to stimulate activity in the reduction of these food losses.—J. B. MAYNE, Executive Officer, N.S.W. State F.A.O. Committee.

SECONDHAND FRUIT CASES.

FROM time to time producers' organisations have raised with the Department the question of fruit case exchanges. Requests have also been made for legislation to prohibit cases being used other than as containers for fruit and vegetables, whilst other suggestions have been made for compulsory surcharges and deposits to be paid by retailers for bags and cases.

Real difficulties would be encountered in attempting to assist producers in any of these ways.

A Secondhand Case Control was administered by this Department during the war, under National Security Regulations, but was allowed to lapse at the end of 1946. It was found extremely difficult to administer under war-time conditions—and could serve no purpose now. Price controls, however, still continue over new and secondhand cases.

It would appear that producers unwittingly contribute to a shortage of secondhand cases by purchasing at prices above those fixed from dealers and carriers. The Secondhand Case Merchants' Association, whose advertisement appears elsewhere in this journal, claims to have as members, 90 per cent. of the secondhand case merchants engaged in the trade. It claims, further, that its members will supply growers' requirements of secondhand cases at the fixed prices.

Producers may obtain roneoed lists of members of the Association from the Chief, Division of Marketing and Agricultural Economics, Department of Agriculture, Box 36A, G.P.O., Sydney, or from Mr. E. Tyson, Hon. Secretary, Secondhand Case Merchants' Association, P.O. Box 39, Haberfield, Sydney.

For the convenience of producers, the schedule of fixed prices for secondhand fruit cases (Prices Regulation Order No. 1940), is set out below:—

The Schedule.

Maximum Prices per Case – Ex Store or Deliveries other than Free on Rail.

Description of Case	Cases not Reconditioned		Reconditioned Cases			
			Sales Without Lids		Sales With Lids	
	Sales by persons other than Case Dealers	Sales by Case Dealers	By persons other than Case Dealers	By Case Dealers	By persons other than Case Dealers	By Case Dealers
	d.	d.	d.	d.	d.	d.
Dump bushel ...	3	5	4½	6½	7	9
Canadian ...	3	5	4½	6½	7½	9½
Pear or Packer, long bushel ...	3	5	4½	6½	6½	6½
Tomato, long half bushel ...	3	5	4	6	5½	7½
Dump half	2	3	3	4	4½	5½
Flat, half-hinged lid	2	4	3	5	6	8
Flat half, or Coff's Harbour	2	4	3	5	4½	6½
Cherry ...	1	1½	2	2½	3½	4
Gin ...	3	5	...	...	5½	7½
Orange Crate ...	3	4½	4	6	5½	7½
Tropical Banana or Pine ...	5	7	7	9	9	11

NOTE: For cases sanded all over add to scheduled prices the following:
(a) one bushel capacity or over — 1½d. each.
(b) under one bushel capacity — 1d. each.

South Australian Farm Record Book.

THE Agricultural College of South Australia at Roseworthy has just published a Farm Record Book, which has been prepared to help the farmers of South Australia keep accurate records of finance and production.

We welcome this South Australian publication as a further indication of the increasing, if belated, recognition of the importance of the business side of farming in this country.

It is interesting to recall that the first Australian Farm Record Book was published in 1942 by the then Division of Agricultural Economics, N.S.W. Department of Agriculture. It has since been revised and reprinted a number of times and during the last twelve months several thousand copies have been sold.

INSECT PESTS.

Notes contributed by the Entomological branch.

CITRUS APHIDS

(*Toxoptera aurantii* and *Aphis* sp).

APHIDS are present to some extent every year, during the spring and autumn, on the young growth of citrus trees. In some seasons, when the tree growth is soft and sappy and remains in that condition for some time, widespread and injurious infestations occur.

The critical period of injury by these insects in coastal areas, is usually from about mid-September to mid-October, but in some seasons, autumn infestations may also be severe. As the growth becomes older and hardens off with the approach of hot dry weather, the aphid populations diminish. In addition, there is an increase in the numbers of their natural enemies, which at this period are more active.

Where the aphids occur in large numbers during the late autumn, they may persist on the trees in small colonies throughout the winter, and thus commence early infestations of the spring growth. When the development of succulent young growth is greatly increased, such as may occur following good rains in late September, the aphids rapidly multiply, and may be particularly numerous during the blossoming and early fruit-setting period. This infestation may cause a considerable reduction in the setting of fruit on some trees, and where quantities of "honeydew" are excreted by the aphids, sooty moulds develop, and a hardening and stunting of the foliage may occur. The fruits on some trees may also be disfigured by the growth of sooty mould upon them.

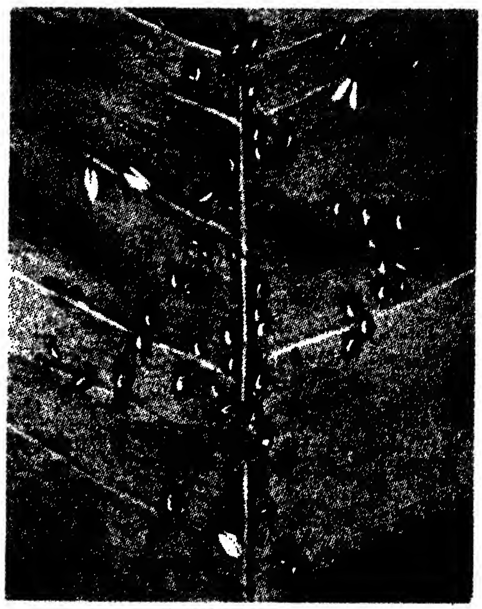
The aphids possess sucking beaks, and feed by puncturing the plant tissues and extracting the sap. The two species most commonly found infesting citrus measure about one-sixteenth of an inch in length. The winged forms are mostly glossy black, and the more robust, wingless forms may be either glossy black, or velvety black, or somewhat brownish-black. The young aphids mostly vary from dull brown to black, but some are reddish-brown.

Control.

Control may be obtained by spraying with:—

Nicotine sulphate	1 pint.
Soft soap	5 lb.
or (White oil emulsion ½ gal.)	
Water	100 gal.

(Nicotine sulphate 1 fl. oz., soft soap 4 oz., *or* white oil ½ oz., water 5 gal.).



Black Citrus Aphids.

In areas where it is necessary also to control diseases as well as aphids, Bordeaux mixture and nicotine sulphate are sometimes applied in a combination spray, the formula being:—

Nicotine sulphate	1 pint.
White oil emulsion	½ gal.
Bluestone	2½ lb.
Hydrated lime	2½ lb.
Water to make	100 gal.

Another combined spray that has proved very effective for the control of citrus aphids consists of:—

Nicotine sulphate	¾ pint.
Lime-sulphur	1 gal.
Casein-lime spreader	1 lb.
Water to make...........	100 gal.

In addition, the lime-sulphur appears to reduce sooty mould to some extent.

Satisfactory control of these aphids may be obtained by the use of either D.D.T. or H.E.T.P. (hexaethyl tetraphosphate) sprays, and where nicotine sulphate is difficult to obtain, these insecticides may be used instead.

D.D.T. is used at a concentration of 0.05 per cent., 1 pint 20 per cent. emulsion to 50 gallons water (1½ fl. oz. to 3¾ gal.).

The D.D.T. spray may be mixed with Bordeaux mixture, lime-sulphur or white oil, where these are required for the control of other pests or diseases. D.D.T. sprays, however, although effective for aphid control, are also toxic to many of the natural enemies of these insects, such as ladybird beetles, hover flies and lacewings.

H.E.T.P. sprays are effective in controlling the aphids at a dilution of 1 in 1,600, *i.e.*, ½ pint in 100 gallons of water (1 fl. oz. in 10 gal.). This insecticide must either be used alone, or with neutral spreaders only. It must not be mixed with Bordeaux mixture, lime-sulphur, lime-casein or white oil emulsion.

CUTWORMS

(*Noctuidae*).

VARIOUS species of caterpillars are known popularly as "cutworms," on account of their habit of eating through the stems of plants at ground level. Cutworms feed upon a wide range of vegetation and may cause extensive damage to young plants soon after they appear above ground, or to newly planted out crops, such as cabbages, cauliflowers, tomatoes, etc.

They mostly feed at night and shelter by day, either in the soil or under clods, but those known as "army worms" may feed during the day, and at times move in vast armies over cultivation paddocks, stripping most plants bare of foliage.

The adults are mostly greyish-brown, reddish-brown, black or buff-coloured moths, which measure about 1½ inches across their outspread wings. They are frequently attracted to lights at night. Some species lay their eggs on grasses and weeds, so that the caterpillars may already be present in the ground when it is being prepared for planting a crop.

The caterpillars vary in size, but mostly measure about 1½ inches in length when fully-fed. They are usually stout, soft-bodied insects, which vary from almost black or slaty-brown to various shades of green or yellow. Their bodies often bear lighter longitudinal stripes or other markings, and many have the habit of curling up into a spiral when disturbed.

Cutworms, when fully-fed, usually make their way down into the soil for several inches, and there enter their pupal or chrysalis stage within earthen cells.

The life-histories of cutworms vary, according to the species, and the locality inhabited. The winter period is usually passed in the resting pupal stage, and there may be several generations in any one season. Under warm conditions the life-cycle, from egg to adult, may be completed in about six weeks.

Control.

As a precautionary measure, any ground that has been covered with weeds and grasses, and has been cleared, or any area where cutworms are already known to be numerous in the soil, should be baited after an interval of several days with poisoned bran mash before planting out.

The poison bait may be prepared according to the following formula:—

Bran	24 lb.
Paris green	1 lb.
Salt	8 oz.
Water	2½ gal.

To prepare the bait, the Paris green and bran should be thoroughly mixed first, and then made into a crumbly mash with the water in which the salt has been dissolved.

Where crops are infested the mash may be distributed lightly along the rows or broadcast throughout the area. The bait is used at the rate of 50 lb. of prepared mash to the acre and is best broadcast late in the afternoon.

As the bait is poisonous, it should be kept out of the reach of stock, and care should be taken in handling it.

Where army worms are attacking crops, a deep furrow cut in front of the advancing caterpillars, with the vertical side nearest the crop, temporarily checks their progress. Holes may be dug at intervals in the furrow, and the caterpillars that fall into them destroyed.

THE HELIOTHIS CATERPILLAR

(*Heliothis armigera*).

W. L. MORGAN, B.Sc.Agr., Entomologist.

THE Heliothis caterpillar feeds upon a very wide range of crop plants and weeds. It is a serious pest of tomato, maize and sweet corn, cotton, linseed, tobacco and lucerne, and is known variously as the maize and tomato caterpillar, corn ear worm, pink boll-worm of cotton, linseed caterpillar, tobacco bud-worm and lucerne seed caterpillar. It attacks the blossoms and fruit of tomato, the ears of maize and sweet corn, the bolls of cotton and linseed, the growing shoots of tobacco, and the flowers and seed-pods of lucerne. It is essentially a fruit and blossom feeder, although it does attack stems and foliage to some extent.

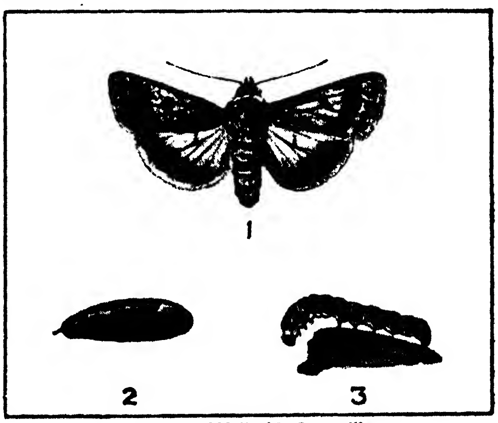
The Heliothis caterpillar also attacks pods of beans and peas, and the green immature fruit of peaches, nectarines, plums, prunes, cherries, pears and apples. It is a common pest of flowers, feeding upon the buds and blossoms of antirrhinum, carnation, dahlia and rose.

The adult stage of this insect is a moth about ¾ inch in length and about 1½ inches across the outstretched wings. The colour of the moths varies considerably, but is generally buff or reddish-brown with indistinct darker markings on the forewings and a black patch on the outer margin of the hindwings, which are whitish.

During the day the moths are inactive and are hidden amongst the leaves, but toward the late afternoon they may be seen flying from plant to plant to lay their eggs. The eggs are white to pale yellow; they are laid singly over most of the plant, but mainly on the blossoms, the young fruit and tender foliage at the top of the plant.

The eggs hatch in from three to five days in warm weather, and from six to twelve under cooler conditions. The young caterpillars often feed upon portions of the tender foliage before attacking the blossoms and fruiting bodies of the plant.

The fully-fed caterpillars are about 1½ inches in length and vary greatly in colour.



1.—Adult of Heliothis Caterpillar.
2.—Pupa. 3.—Caterpillar

Flower Buds of Tomato Plant, showing Eggs of the Heliothis Moth Laid on the Stalk.
[*Enlarged about six times.*

Some are pale green to dark green in general colour with little or much black markings, others are pale yellow with brownish markings, while others are buff-coloured with broad, brown stripes. The caterpillars attain their full size in about fourteen to twenty-one days in warm weather, and from three to six weeks under cooler conditions. When fully-fed, they burrow into the soil and pupate at a depth of about 4 inches. The pupal stage may be as short as fourteen days, but in dry weather or under cool conditions, four or five months may elapse before moths emerge from the pupae.

In warm weather the minimum length of life-cycle from egg to adult is about thirty days, and in mild spring and autumn weather, forty to fifty days.

The two main periods of Heliothis infestation are in the spring and early summer, from mid-September to mid-December, and in the late summer and autumn, from February to April. Moths do not emerge from pupae while the soil is dry, and as a result infestation generally is light during dry summer weather. However, in periods of good summer rainfall, when food plants are plentiful and soil moisture is favourable to quick emergence of moths, infestation may be widespread. At such times, pome and stone fruits are attacked, in addition to vegetable and field crops.

Control.

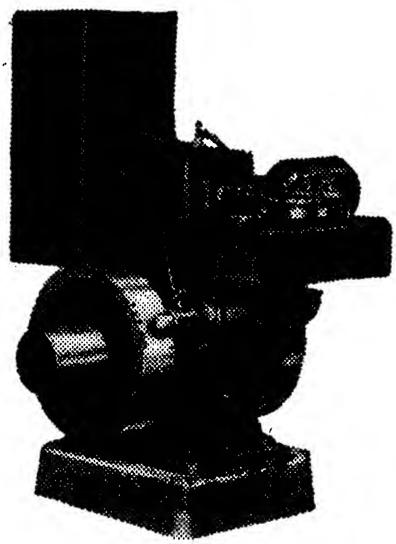
D.D.T. sprays and dusts will control Heliothis caterpillars in all crops, although when maize and sweet corn are infested, the cost of treatment, generally, will exceed the loss sustained.

Crops should be treated while the caterpillars are still small, and before they are capable of causing serious damage. Heliothis moths often appear in crops after rain, and a few days later, eggs and young caterpillars become plentiful. Thus, in many instances, treatment for control should follow within ten days to a fortnight of a fall of rain sufficient to wet the soil to a depth of 3 to 4 inches, and so cause moths to emerge from pupae in the soil.

Vegetables and Flowers Generally.

The standard concentration of 0.1 per cent. D.D.T. spray, or 2 per cent. D.D.T. dust, may be used for the control of Heliothis caterpillars in most flowers and vegetables. To prepare 50 gallons of 0.1 per cent. spray, 2 pints of 20 per cent. D.D.T. emulsion or 1 lb. of dispersible D.D.T. powder would be required. For 2½ gallons of spray use 2 fluid oz. of emulsion or ¾ oz. of dispersible powder.

Heliothis Caterpillars Attacking a Young Tomato Fruit.
[*Enlarged about six times.*

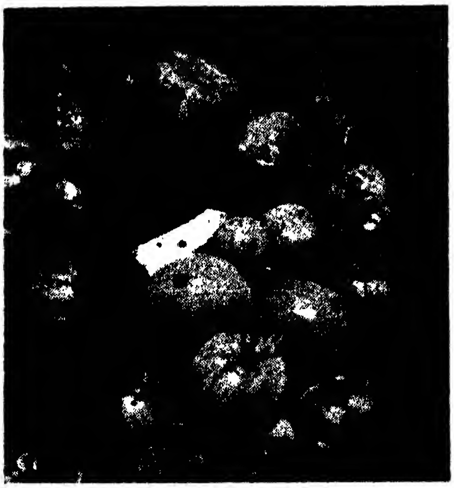


In the home garden, sprays may be applied with a bucket pump, or a hand mist sprayer, and dusts may be applied with a small hand duster, or they may even be shaken on to the plants through a hessian or cheesecloth bag.

Knapsack spraying or dusting will be suitable for small commercial areas of flowers or vegetables, but power spraying or dusting may be necessary for large areas.

Tomatoes.

Spray or dust with D.D.T., at seven to fourteen day intervals, while the plants are setting fruit. Treat every seven days for severe infestations, every ten days



Tomatoes from a Single Untreated Plant Lost through Damage by Heliothis Caterpillars.

for moderate infestations, and every fourteen days for light infestations. Sprays should be 0.05 per cent. concentration (1 pint 20 per cent. emulsion to 50 gallons spray). Dusts should contain 1 per cent. D.D.T. A small power spray pump fitted with light (¼ inch bore) extension hose up to 200 feet in length may be used for spraying staked or trellised tomatoes. The light hose is dragged along the row while spraying proceeds. Laneways are left through the crop for the spray pump.

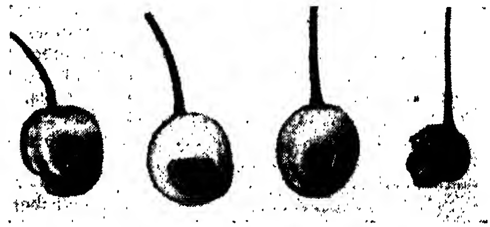
D.D.T. may be mixed with the different sulphur and copper preparations that are used on tomatoes. Fruit should be wiped after picking to remove D.D.T. residues.

Tobacco.

Spray with 0.1 per cent. D.D.T., or dust with 1 per cent. D.D.T. powder, at intervals of two to four weeks, depending on the severity of the infestation. In particular, treat the growing tip and top growth generally.

Stone and Pome Fruits.

Spray with 0.05 per cent. D.D.T., using either dispersible powder or emulsion.



Cherries Damaged by Heliothis Caterpillars.

Lucerne Seed Crops and Linseed.

Dust with 5 per cent. D.D.T. powder, at the rate of 15 to 20 lb. per acre. A single treatment by power duster, or by aeroplane, about a week after crops are in full flower, should control most infestations. Power spraying in linseed, or lucerne, would be slower than dusting, and would require large quantities of water. However, machines now available that apply concentrated insecticide as a very fine mist or fog (aerosol) appear to have promise for treating lucerne and linseed for Heliothis control. The rate of application, per acre, would be about 2 lb. dispersible D.D.T. powder in from 2 to 6 gallons of water, the crop being fogged in 20- to 30-foot strips.

Maize and Sweet Corn.

Possibilities for controlling Heliothis in maize and sweet corn include treatment of

Prunes Damaged by Heliothis Caterpillars.

the individual ear with a few drops of white mineral oil (viscosity 200-250), or with 5 per cent. D.D.T. powder. The silks

(*Continued on page* 492.)

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Gosford (W. B. Graham)	September 17, 18
Ardlethan	September 18
The Rock (A. F. Walker)	September 18
Eugowra (R. S. Noble, President)	Sept. 21, 22
Leeton	September 21, 22
Quandialla	September 22
Tooraweenah	September 22
Hay	September 24, 25
Junee	September 24, 25
Molong	September 24, 25
Ariah Park	September 25
Bribbaree	September 29
Cudal	October 1
Illabo	October 2
Griffith	October 5, 6
Walbundrie	October 6
Singleton	October 7, 8
Culcairn	October 9
Albury	October 12, 13, 14
Kyogle	October 13, 14
Cootamundra (D. H. Boyd)	October 15, 16
Lismore National	October 19, 20, 21
Holbrook (Thelma Stewart)	October, 22, 23
Alstonville	October 27, 28
Murwillumbah	November 3, 4
Mullumbimby	November 10, 11
Bangalow	November 17, 18
Nimbin	November 24, 25

1949.

Albion Park	January 14, 15
Dapto	January 21, 22
Lithgow	February 4, 5
Liverpool	February 5, 6
Luddenham	February 11, 12
Paterson	February 11, 12
Dorrigo (H. S. Doust)	February 16, 17
Tenterfield	February 17, 18, 19
Gunning	February 18, 19
Wyong (F. Akhurst)	February 18, 19
Newcastle (P. Legoe)	February 23 to 26
Guyra	February 25, 26
St. Ives	February 25, 26
Yass	February 25, 26
Walcha	March 1, 2
West Maitland (R. E. Holroyde)	March 2-5
Glen Innes	March 3, 4, 5
Penrith	March 4, 5
Queanbeyan	March 4, 5
Uralla	March 4, 5
Tumbarumba (Mrs. U. M. O'Shea)	March 8, 9
Braidwood	March 11, 12
Blacktown	March 11, 12
Burrowa	March 11, 12
Cessnock	March 11, 12
Inverell	March 11, 12
Armidale	March 17, 18, 19
Crookwell	March 17, 18, 19
Barraba	March 18, 19
Gresford	March 18, 19
Parramatta	March 18, 19
Warialda	March 22, 23
Taralga	March 24, 25
A.C.T.	March 25, 26
Bingara	March 25, 26
Castle Hill	March 25, 26
Dungog	March 25, 26
Manilla	March 25, 26
Muswellbrook	March 29, 30
Tamworth	March 29, 30, 31
Goulburn	March 31, April 1, 2
Quirindi	April 1, 2
Sydney Royal	April 9 to 19
Gunnedah	April 26, 27, 28
Boggabri	April 29, 30
Narrabri	May 5, 6
Hawkesbury District (Clarendon), T. J. Cambridge	May 5, 6, 7

Approved Vegetable Seed—September, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—continued.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Pumpkin—

Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Tomato—

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

PLANT DISEASES

FROST INJURY OF WHEAT.

(*Concluded from page 426.*)

F. C. BUTLER, B.Sc.Agr., Assistant Plant Pathologist.

THE extent of the damage caused to wheat crops by frost injury, and the symptoms shown by the plants on leaf, stem and head were discussed in the first portion of this article which appeared in the August issue.

Similarity to Other Types of Injury.

Attention has been drawn to the fact that it is possible to confuse certain of the symptoms of frost injury described, including the development of white heads, tip-blighted ears and shrivelled grain, with injury due to other factors.

In particular, similar symptoms may be caused by:

1. Hot drying winds, especially when they affect crops growing in shallow, moisture-deficient soils; and

2. Infection with parasitic root rot diseases, such as take-all and foot rot.

Because wheat plants which have been previously injured by frost are more susceptible to root rot diseases than uninjured plants, the occurrence of plants showing symptoms of both frost injury and root rot infection is common.

In some instances it may be difficult to decide which of the factors mentioned—frost damage, root rot and wind damage—has been primarily responsible for injury. The accompanying chart of symptoms should assist in correctly diagnosing the cause of injury.

Frost Injury.	Take-all and/or Foot Rot.	Hot Drying Winds.
1. Heads variously injured in tip, central and basal regions or showing complete white head condition.	Heads bleached white or with dull, faded appearance. May be tip-blighted, but central or basal ear portions not affected.	All spikelets on ear killed or greater or lesser number affected from the tip down.
2. Most common in low-lying areas or depressions. Area affected usually extensive.	Occur anywhere in the field, usually in well defined patches although foot-rotted plants may be scattered through crop.	Most common on the tops of hills and ridges or on exposed slopes. Area affected usually extensive.
3. Young plants not stunted prior to frosting, although subsequent growth temporarily retarded. Leaves blighted from tips usually to about half their length, subsequently becoming brown and brittle.	In early stages of crop growth plants stunted and leaves yellowing.	Plants not stunted unless suffering from drought. Leaves may curl up, exhibit tip blighting but not usually killed.
4. Plants often exhibit profuse restooling.	Plants exhibit reduced tillering.	No effect on tillering.
5. Root system of affected plants not rotted.	Root system of affected plants definitely rotted.	Root system of affected plants not rotted.
6. Lower stem portions develop brown discolouration. Stems sometimes swollen, soft and spongy, may split longitudinally. Ring-barking may occur.	Outer basal stem sheaths as well as stems proper are discoloured. Basal regions of take-all infected stems have dark incrustation of fungal threads which can be flaked off. No stem swelling, splitting or ring barking.	No brownish discolouration although prolonged wind scorching may cause plants to "yellow off." No stem swelling, splitting or ring barking. No dark incrustation.
7. Basal joints (nodes) frequently discoloured, ruptured and swollen, often associated with stem distortion and buckling. May show blistering effect.	Basal joints may be discoloured, but never ruptured or swollen. Stem distortion and blistering effect absent.	Basal joints not discoloured. Never swollen or ruptured, tendency for joints and surrounding stem tissue to shrivel.

Effect of Frost on Crop Growth.

The immediate effect of frosting, apart from the appearance of symptoms such as have been described, is to temporarily check crop growth. Frosts which cause tip-blighting of the leaves only are not usually serious. This type of injury is not of a permanent nature in that the yield of grain is seldom materially affected.

Stem and head frosting are much more serious. When plants are severely stem frosted, the entire plant above the affected joints may die. In this event, the general effect under favourable conditions is profuse re-stooling. If frosting has been par-

ticularly severe this second growth may represent the whole of the crop ultimately harvested. Though this late tillered growth often shows excellent development, it rarely yields up to indications.

On the other hand, the second growth when partial killing occurs, represents only a portion of the crop, because some original growth eventually comes into ear. In such circumstances the second growth invariably matures later, with the result that both immature and mature heads are harvested.

Because frosted stems are weakened at the joints, they are liable to lodge under the influence of heavy rain and high winds. Provided such stems do not break off completely, they may "elbow up" to a vertical position again from an uninjured node.

"Haying-off."

The condition known as "haying-off" is also frequently attributable to previous frost injury. "Haying-off" is characterised by a sudden premature ripening of the ears, following the development of an unhealthy, dull green colour and a brittleness in the upper part of the stems. Though the stems maintain a greenish colour, they turn dry within a short time. As a result the supply of moisture and food materials to the ear is curtailed and the grain fails to develop to any appreciable extent.

"Haying-off" is frequently observed following hot drying winds in October and November, and is particularly noticeable in frosted crops or in crops suffering either from drought or root rot infection. Indeed, any factor resulting in a deficiency of moisture at critical periods of plant growth may cause "haying-off."

Factors Which Predispose Crops to Frost Injury.

Throughout the wheat belt proper conditions are extremely favourable for the development of severe winter frosts, with calm clear nights and a comparatively dry atmosphere.

During normal winters frosts are continually recurring without any prolonged period of mild weather conducive to rapid, succulent growth. Consequently the plant has an opportunity to "harden" and is able to withstand quite severe frosts without undue injury occurring.

On the other hand, abnormally mild winters with only an occasional severe frost, favour the development of lush, succulent growth which is very frost-susceptible. In such seasons, considerable damage occurs not only to the flag but also to the ear in the pre-emergence stage. Moreover, as a result of too-forward growth, a crop may be wholly or partially destroyed as a grain proposition through the ears being injured at the blossoming stage by unseasonably severe frosts in the spring.

In addition, frost injury is usually more severe in:—

1. Early maturing varieties sown out of season and favoured by good growing conditions. Such crops come into ear too early and suffer severely from spring frosts.

2. Crops growing under dry or semi-dry soil conditions.

3. Crops growing on poorly prepared land, which is loose and uncompacted. This is doubtless connected with the poor moisture-retaining capacity of such land.

4. Crops growing on low-lying land or in the lower lying areas of undulating country.

5. Crops growing on slopes with an eastern or northern aspect. Crops on slopes not directly exposed to the morning sun appear to suffer less severe injury, presumably because they are not subject to such quick thawing.

6. It has repeatedly been noted that frosts are most severe near areas covered by strips of scrub or timber. It is believed that timber belts interfere with air movement and by preventing circulation of warm air in their near proximity, favour the formation of frost.

Varietal Susceptibility to Frost Injury.

Unfortunately, no variety of wheat grown on a commercial scale in New South Wales is highly resistant to frost. Some varieties, however, appear to have a higher degree of frost-resistance than others. This is perhaps more a consequence of their seasonal maturity and growth habit than it is of any inherent resistance to frost injury. As a generalisation, therefore, late-maturing varieties, which have a good stooling capacity and a procumbent habit of growth suffer less from frost injury than do early-maturing varieties, which have a tendency to run quickly up to stem.

There also appears to be quite a high degree of correlation, under southern wheat belt conditions at least, between frost resistance and drought-resistance. Thus the majority of varieties which are able to withstand severe drought conditions are also able to withstand severe frosting much better than drought-susceptible varieties.

The following varieties have proved very susceptible to frost, particularly when sown out of season: Charter, Dundee, Ford, Gabo, Gular, Kendee, Pusa 111, Pusa 4, Rapier, Yalta, Koala, Bobin, Cailloux, Florence and Geeralying.

Although an occasional variety listed is of midseason maturity, it will be noted that the majority are early-maturing types. With such varieties care should always be exercised to avoid sowing either too early or in frost-liable situations.

In view of the lack of frost-resistant varieties, it is interesting to note that the incorporation of cold-resistance is in future to be considered a major breeding objective in this State. Improvements are to be sought by the use of American northern spring wheats as parents and by the breeding of early-maturing winter wheats.

Recommended Control Measures.

In the absence of frost-resistant varieties, complete control of frost cannot be achieved. However, the adoption of the following recommendations should materially assist in minimising losses from frost injury.

1. Sow varieties at the correct time of year as determined by their seasonal characteristics. Early-maturing varieties such as Gabo, Geeralying, Gular, Ranee, Rapier, Sword, Bobin, Cailloux, Duri, Pusa III and Pusa 4 should be sown late.

2. Sow in a firm, well-compacted seed-bed. Such a seed-bed can only be obtained by early preparation and sufficient working of the land at the correct times, so that the underlayers become consolidated by the joint action of implements and weather.

3. Feed off rank and forward crops which have either been sown too early or have developed as the result of favourable growing conditions during a mild winter.

4. Do not sow very frost-susceptible varieties such as Charter, Ford, Pusa 4, Kendee and Gabo in frost-liable situations, *e.g.*, in low-lying areas, when the sowing could have been made on higher ground.

5. On irrigable land, watering when frost occurrence is imminent usually assists in reducing possible losses. The reason for this is given on page 484 in the explanation of frost occurrence. However, whilst irrigation prevents a fall in temperature during the night, it also retards heat absorption during the day. Consequently, whilst frost danger may be minimised for one or two nights, danger from a third or fourth frost may possibly be increased.

6. Carefully inspect crops for injury, particularly after severe spring frosts. If damage is extensive, cut affected crops for hay and so avoid reduced yields at harvest time.

Explanation of Frost Occurrence.

The following brief explanation of the conditions causing the occurrence of frost will be of interest:—

During the day heat is radiated by the sun. This radiated heat, though absorbed by both the earth and the air above it, is taken up to a considerably greater extent by the earth which, in effects, acts as a giant heat trap, with the adjacent air serving as an insulator.

In the late afternoon the air nearest the earth is warmer than that at higher altitudes. There is, in fact, a more or less uniform rate of fall in air temperature of 1 deg. Fahr. for every 300 feet above ground level.

When the sun's rays cease to maintain the surrounding air at ground level at the same temperature as the earth, some of the heat absorbed by the earth during the day is radiated into the air. The first layer of air to be warmed, of course, is that immediately adjacent to the earth. It, in turn, radiates heat to the layer above it and this process continues until most of the heat in the earth and adjacent air layers has been radiated progressively upwards to the air layers from 300 to 500 feet above ground level.

The effect of this continuous transference of heat from layer to layer, is that when the earth's heat supply is ultimately depleted, a layer of cold air remains immediately above the surface of the earth, with warmer layers above.

If the heat radiation and consequent cooling of the earth's surface has been sufficiently great, the ground temperature will fall to or below 32 deg. Fahr. and frost may occur.

Frosts develop under high pressure conditions, characterised by a cloudless or near cloudless environment in which the air has a low moisture content and very little movement.

Cloud formation, by acting as a protective blanket, checks the loss of heat by radiation from the soil into the upper air layers. Consequently, the air layer adjacent to the soil remains warm and frosts do not occur.

The effect of wind is to mix the warm air in the "inversion" layer with the cold air near the ground. This not only has a moderating influence on air temperatures, but by preventing a cold layer of air from settling above the ground, further removes the danger of frost development.

A particular feature of frost occurrence is its tendency to develop most severely in low-lying areas. As a result, it is usual to find plants damaged by frost at the foot of a hill, rather than at or near the summit, or in depressions rather than on the rises in undulating country. Likewise, in predominantly flat country, broken for example, by gilgai formation or even smaller depressions, frost damage will invariably be found to occur more extensively at the lower levels.

An explanation of this occurrence is to be found in the fact that the "weight" of air increases with lowered temperatures. Consequently cold air, being heavier, will tend to gravitate to the lowest level, concentrate there and so lead to the formation of frost pockets.

There is also a tendency for frost development to be less severe in the vicinity of a large volume of water. This tendency is associated with the fact that water has a greater retentive capacity for heat absorbed than the earth and does not radiate so rapidly. Hence it is able to exert a more prolonged moderating influence on air temperatures. Moreover, because the moisture content of the air over or near large volumes of water is high, there is a tendency for a greater condensation of moisture. In this process of condensation heat is liberated. The heat so liberated, by arresting further loss of heat by radiation from the water surface itself, at least temporarily reduces the possibility of frost formation. For this reason frost is seldom severe in close proximity to the sea or on the foreshores of a lake.

Although frosts are essentially a winter phenomenon, out-of-season frosts do occur, particularly in the spring. Indeed, unseasonable spring frosts are liable to cause more serious losses in cereal crops than the majority of winter frosts.

Home Bacon Curing.

BACON curing on the farm is entirely different to factory curing, but the home product, provided it is properly handled and necessary attention is given to important details, can be just as satisfactory as any the farmer can buy.

On the farm without refrigeration curing should be done in winter during frosty weather, and in a humid atmosphere such as that of a cellar, rather than in a dry atmosphere. Extremes of temperature are unfavourable for the process.

Pigs selected for slaughter should be free of disease and in a healthy condition, gaining and not losing weight. They should be properly furnished and free of bruises, cuts, sun-scald, etc. Live weight should be about 180-200 lb. at about six to eight months old; this gives a dressed weight of about 125 to 140 lb.—a desirable weight to produce first-class bacon for local requirements. Some farmers prefer pigs of much higher weight, but excessive fat and overweight carcases are undesirable.

Breeding is important in producing suitable carcases, and pure-bred sires of outstanding type and quality are necessary to produce ideal bacon pigs. Selection, careful handling and intelligent feeding are also imporant.

The departmental leaflet "Bacon Curing on the Farm," from which the above paragraphs were taken, also gives full details on treatment of pigs before slaughter, slaughter, scalding, dressing, cutting-up, and methods of curing. It is available free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

APIARY NOTES

AMERICAN FOUL BROOD.*

The Problem in New South Wales.

D. L. MORISON, B.V.Sc., Apiary Branch.

IN recent years the average New South Wales beekeeper has become more "foul brood conscious" than heretofore—probably because either an outbreak of American foul brood has occurred in his apiary or near vicinity, or he has heard of outbreaks. This is all to the good, since the more a beekeeper knows of this disease the more readily he will recognise the early indications of infection, should the disease occur. He will then be in a better position to avoid practices which may result in spread of the disease.

American foul brood disease of bees has been known since ancient times—reference to what was probably American foul brood was made in literature two thousand years ago—and its control is a problem of beekeeping in most parts of the world.

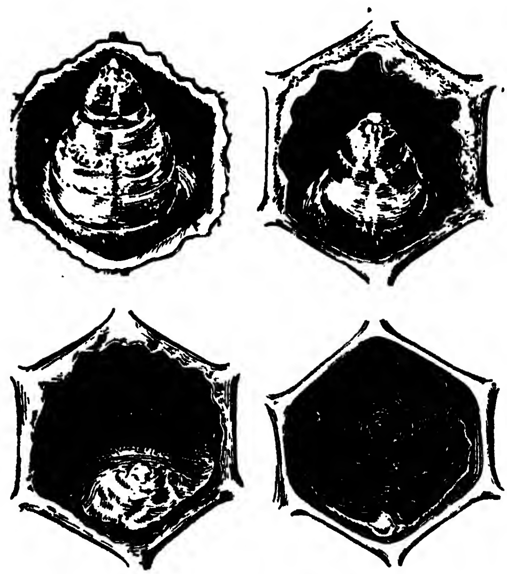
The date of introduction of American foul brood into Australia is uncertain. Some of the older beekeepers refer to very serious outbreaks of the disease in southern New South Wales and Victoria which practically wiped out the beekeeping industry in the late 1800's and early 1900's. Albert Gale, when Lecturer on Apiculture to the New South Wales Government, writing of the period about 1900, says: "A disease far more destructive to bees than the Bee Moth, and which bids fair to be far more serious, made its appearance amongst our bees—foul brood. On one occasion at Bombala I saw over 100 colonies of bees destroyed by this disease. . . . Districts that were regarded as ideal as apicultural ones were almost swept clear of bees."

It will thus be seen that the American foul brood problem has been regarded seriously for quite a long time. Moreover, owing to the nature of the disease, it appears that foul brood will always be a problem in a greater or lesser degree according to the measures taken to suppress it and factors conducive to its spread.

Unless the average beekeeper is aware of this fact and is constantly on the alert for the first signs of this disease, an outbreak may occur in his apiary and cause serious loss, before he has realised what has happened.

Causal Agent.

Many apiarists are in doubt as to the origin and nature of American foul brood.

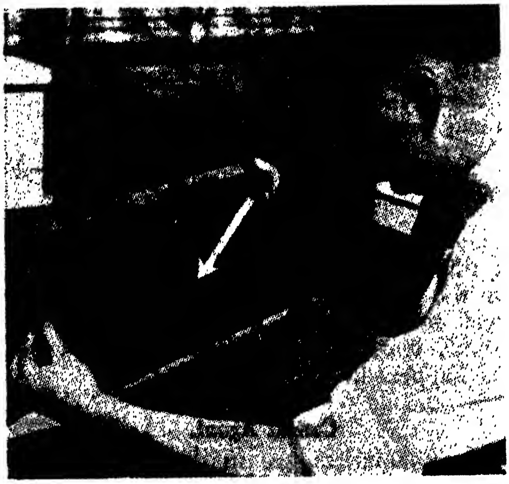


Stages in the Decomposition of Bee Larva Dead of American Foul Brood.

[After Hambleton.

* A previous article on this subject appeared in the May, 1945 issue of *The Agricultural Gazette*. However, in view of the widespread interest in the subject, a more comprehensive description of the foul brood position has now been prepared.

American foul brood is caused by the active presence in the bee brood of *Bacillus larvae,* a specific bacterium; in the absence of this organism American foul brood cannot occur. *Bacillus larvae* occurs in both vegetative and spore forms. The vegetative form, which is present in young larvae affected with the disease, is that in which the organism grows and multiplies. When the vegetative form has exhausted the food supply in the larva, it transforms into spores.



Inspecting a Comb for Brood Diseases.

The comb should be held so that the sun's rays fall on the lower side and bottom of the cells—as indicated by the arrow in this illustration.

[*After Burnside and Sturtevant.*

Spores are not capable of multiplying, but might be considered as the "seed stage" of the organism. In this stage it remains dormant until conditions again become favourable for its growth as the vegetative form—as when it is introduced into a young bee larva.

It is this spore form which gives rise to considerable trouble in the eradication of the disease, since it has been proved viable for at least fifteen years and may live much longer than that. Spores are resistant to most disinfectants, though 20 per cent. formaldehyde will kill them in a few hours. Moreover, they are rather resistant to heat, and it is considered that it is necessary to boil them in 1 per cent. caustic soda solution for 30 minutes to be certain that they are killed.

Like most bacteria, *Bacillus larvae* is very small, and can only be determined in diseased material by proper microscopic examination.

Symptoms of the Disease.

In order to detect brood disease conditions, including American foul brood, it is first necessary that the beekeeper be familiar with the appearance of normal brood—and most beekeepers have this knowledge.

When *Bacillus larvae* spores are fed to young bee larvae in sufficient quantities to cause the disease, the following will be noticed:—

An infected larva may first lose that glistening, white appearance associated with normal health, and slump along the lower side of the cell. The affected larva will assume a yellowish tinge, and its normal approximately circular cross section will become increasingly oval as the larva sinks gradually. As the disease progresses, the colour will change to what is described as coffee brown, and the larva will become even more flattened in shape. Finally, a flat, black scale remains rather firmly attached to the lower side of the cell.

In an advanced case of the disease, where many of these scales are present, a rather characteristic, objectionable odour can be detected, this having been described as a "glue pot odour." However, this odour is only marked in advanced cases of the disease, and is no use for the purpose of diagnosis in the early stage.

Many of the affected larvae will be sealed by the worker bees and for a time the cappings may appear to be fairly normal. However, when the healthy brood emerges from a batch in which a percentage is affected with American foul brood, the brood assumes a very irregular appearance. Usually the cappings over affected larvae become sunken and discoloured and many may be torn by the bees when attempting to reopen such cells, leading to a number of perforated cappings.

To detect an early case of the disease needs a practised and trained eye. However, when in its advanced stage, any person knowing the appearance of a normal brood nest cannot help knowing that something is wrong.

While the above indications are useful in arriving at a diagnosis of American foul brood, there is one particular symptom that

is usually considered to be specific for this disease. If, when a small twig is inserted into one of the larvae which is at the coffee brown stage and the twig is withdrawn, the larva strings out for quite a distance—perhaps two or three inches or more. It is this viscous, "ropy" characteristic of larvae at this stage of the disease which is usually relied upon by the beekeeper for differentiation of American foul brood from other brood diseases.

The diagnosis of American foul brood in an apiary can be confirmed in the laboratory by microscopic examination of smears from the larvae and the demonstration of the vegetative forms of *Bacillus larvae*, if present, and the spores. However, this is usually not considered necessary, as most cases of American foul brood are clearly defined to the experienced inspector. In the early stage of the disease, the bacteria are mainly present as the vegetative stage, whereas the scale stage contains millions of spores, and is most dangerous as a source of re-infection.

Differential Diagnosis of the Main Brood Diseases.

The following table enables comparisons of the symptoms of American foul brood and sacbrood:—

	American Foul Brood.	Sacbrood.
Age of infected brood.	Late larval and early pupal stage.	Most stages.
Colour of dead brood	At first dull white, then varying shades of brown. The scale is usually black.	Usually greyish.
Scale	Oval, flattish, firmly adhering to lower side of cell.	Extended on lower side of cell with head raised; "Gondola-shaped."
Odour	Characteristic "glue-pot" odour.	None.
Consistency of dead brood	At first watery but later "ropy," as it approaches the hard brittle scale stage.	Outer skin tough, contents watery and granular.
Microscopic picture	Vegetative forms and spores of *Bacillus larvae* present in larvae of different ages.	No bacteria present. (Due to a virus.)

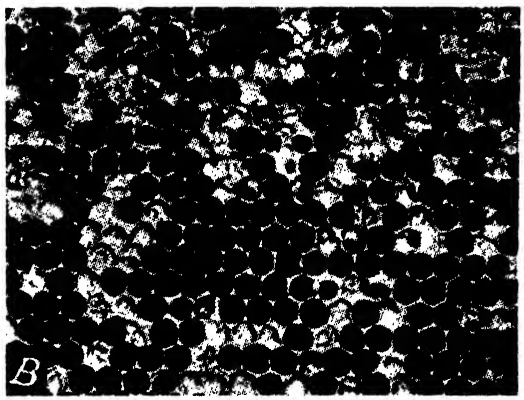
Odd instances of colonies of bees showing symptoms similar to those of European foul brood have occurred in New South Wales, in which the young stage larvae have been affected and a putrefactive odour has been present. However, such cases do not appear to be true European foul brood, nor do they appear to be of major significance.

At times, abnormal brood is noticed, which is due to starvation, chilling, drowning, overheating, etc. However, in none of these instances are the symptoms characteristic of American foul brood present.

Any apiarist in doubt as to the nature on any condition affecting the brood should send a sample to the Department of Agriculture for expert diagnosis.

Factors Influencing Spread of the Disease.

Before an infection with American foul brood can be set up in a colony, it is necessary that it receive what is termed a minimal infective dose of the organism. This has been estimated at 50,000,000 spores per colony.* However, this number will vary, depending upon the resistance shown by the colony to this disease and the virulence of the particular strain of *Bacillus larvae*.



Old Brood Comb showing Advanced Stage of American Foul Brood.

[*After Burnside and Sturtevant.*

Once American foul brood has gained access to an apiary where conditions are conducive to its spread, and control measures are not instituted, the following occurs:—The colony or colonies first affected becomes seriously weakened from loss of brood, and may eventually die out. When this happens the hive may be robbed out by bees from other colonies in the apiary and the robber bees may carry back to their own colonies some *Bacillus larvae* spores,

* *Jrnl. Agr. Res.*, 45, 257-285.

which may then set up a fresh infection. It is possible also that drifting bees and young bees taking play flights may help to spread the spores.

If the infection occurs in a hive in a commercial apiary or other apiary in which combs are often transferred from one hive to another, it can readily be seen that the transfer of affected brood combs or honey combs containing infected honey will readily spread the disease from one colony to another, and interchangeability of material may be a big disadvantage should American foul brood be present in the apiary and the beekeeper spread the disease in this manner.

The robbing and extracting of the honey presents problems of special significance when American foul brood is present in some of the colonies. Not only may infected "sticky" combs be placed back on clean hives, but the bees may be afforded opportunities to rob honey from the sticky combs and extracting plant generally; spores may also be spread from one comb to another per medium of the honey extractor.

Therefore, once American foul brood has been diagnosed in the apiary, interchange of material should be restricted to a minimum, so that the possibility of spread of the disease will be minimised while the necessary inspections are being carried out to eliminate infected hives.

In a small apiary in which little interchange of material is practised, it is often found that several colonies are "absolutelv rotten," while others appear quite healthy, and it may be that the disease will be eliminated when those colonies showing symptoms are burnt.

However, in the large commercial apiary in which interchange of material is freely practised, the following picture is often found: There may be some colonies in an advanced stage of the disease, but very often there are not. It may be found that quite a big percentage of the colonies are showing a few cells affected with the disease, and on occasions only one affected larva has been found in a diseased colony. This is due to the fact that the spores have been rapidly spread over a large number of colonies by interchange of material, and the initial dose of spores in infected hives has not been sufficient to bring about a heavy infection at the commencement, though, of course, the ultimate result of such spread of spores can only be catastrophe.

Factors Influencing the Spread of the Disease Between Apiaries, Districts, etc.

At one time the more important factors influencing the spread of the disease over beekeeper bought infected colonies and infected colonies of bees, honey, or hive material. It can readily be seen that if a beekeeper bought infected colonies and introduced them into a clean district, the spread of the disease would, as a consequence, be accelerated.

When foul brood-infected colonies are extracted and the honey is marketed, it may reach quite a variety of destinations. Perhaps a beekeeper may feed some of it to his bees during a time of dearth, and thereby infect them. The honey containers may be thrown out and robbed by the bees. Second-hand 60-lb. honey tins and drums are often sent to beekeepers while still in a sticky condition, and this is a possible way of spreading the disease. Sometimes a beekeeper will buy second-hand hive material—especially in these days of shortages—the original occupants of which may have died from American foul brood; this will result in introduction of infection into the buyer's apiary, especially if scales should be present in the combs.

Beekeepers should be very careful about feeding honey to bees unless they know that it came from an apiary free of American foul brood, and second-hand hive material purchased should be thoroughly boiled for half an hour in 1 per cent. caustic soda solution unless it is known to be perfectly free from *Bacillus larvae* spores. Because of the possibility of disease transmission in bees or material, it is especially necessary that the apiaries of any queen breeders or other sellers of bees should be free from brood disease, since such apiaries could spread it to a large number of others.

In recent years a far more rapid and efficient means of spreading the disease has become apparent as a result of the increase in migratory beekeeping. Some migratory

beekeepers move their colonies great distances, sometimes interstate, and it can be realised that, if a migratory beekeeper moves into a district where foul brood is present and his bees contract the disease, he may take that disease hundreds of miles to a clean area when he next shifts. It is this possibility of introduction of American foul brood into clean areas with migrated bees that has given rise to anxiety in the industry, and the increased interest in American foul brood which has been apparent of late.

A certain amount of migratory beekeeping is essential if the best is to be made of a district's flora. However, the continuous moving about from district to district indefinitely is not only a costly procedure, but is likely to precipitate a crisis from the disease viewpoint.

It has been generally found that, in the development of a primary industry, increasing numbers and more congested populations of the species of plant or animal concerned result in disease becoming a limiting factor in further progress unless special disease control measures are instituted. It will be necessary for migratory beekeepers to adopt a more rational attitude in regard to the movement of bees if they are to avoid similar restriction as the industry develops.

(To be concluded).

Temperament in Dairy Cows.

Dehorn or Cull Aggressive Animals.

SOME cows are naturally aggressive while others are timid. The aggressive beast is a menace in the assembly yard and may cause considerable injury to other cows, involving the owner in financial loss through loss of time in treating the injured animals, cost of medical supplies used, and depletion of yield from affected animals.

In the majority of such cases the most profitable remedy is to get rid of the "bully," but in others, a satisfactory solution is to be found in dehorning.

The main objection raised to dehorning is that the appearance of the herd is somewhat spoilt.

In the commercial herd this factor should not be taken into account, because the principal objective is milk and butter-fat yield, and show value is negligible.

In the case of pure-bred stud book herds, objections have been raised to this practice. These cattle, however, represent a very small percentage of the milking cows in the dairy herds, and because of the handling and care which they receive from birth, they are, on the whole, much less aggressive in the yard and respond more readily to the process of "breaking in" than is the case with grade cows.

The timid beast causes less damage in a herd than the aggressive animal, but at the same time, its presence in the herd is a disturbing factor which causes loss of production. Some animals will, at the sight of any unusual object or movement, cause a mild stampede, in which injury is likely to occur to the most docile beast in the herd through violent contact with other animals or through being rammed on to wire or other fencing material.

Both aggressiveness and timidity are hereditary qualities, and in culling on account of these defects it may be advisable to remove more than one member of a family from the herd.—DIVISION OF DAIRYING.

Four Faults in Milking.

THERE are many points at which cream can be contaminated, and if his product is to be consistently graded "choicest" it is necessary for the farmer to be watchful at them all. Careless milking methods are a common cause of trouble. Inferior quality in milk may be introduced as a result of any of the following:—

1. Failure to wash the hands regularly and frequently while milking, and to change the water after every five or six cows have been milked.

2. Failure to wipe the cow's udder free of dust, mud and manure, and to wash the teats prior to milking, preferably with water to which a little hypochlorite has been added.

3. Using unclean cloths for the cow's udder, or dirty towels for the milker's hands.

4. Failure to discard the first few squirts of milk from each teat.

Other causes of inferior quality cream are discussed in a leaflet entitled "Common Defects in Milk and Cream," obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

CARE OF THE HOUSE COW.

Hints on Selection and Maintenance.

G. L. McCLYMONT, B.V.Sc., Veterinary Research Officer.

MANY farmers who keep a house cow or two could obtain a much better return from the animals if they devoted a little more care to feeding and management—and many others could, with considerable benefit to their families, run a cow to supply domestic needs.

The questions that commonly arise when a decision is made to keep a house cow are answered in this short article, which should also prove of benefit to those who already have a cow on the farm.

What Equipment Is Needed?

The essential pieces of equipment are:—

Milking Bails.—Plans of suitable bails may be obtained from the Department, or the essential requirements can be ascertained by inspecting bails in a dairy. Roofing and a concrete floor make milking more pleasant.

Feed Box.—This can be fitted to the bails or placed somewhere in the grazing area.

Grazing Area.—The larger the area, the better, as the cow can obtain more feed by grazing, but a small area is quite sufficient provided the cow is well fed.

Milking Buckets.—Suitable types may be obtained from firms supplying primary producers' requirements.

Feed Shed.—All feed must be protected from damp and rain.

How Old Should the Cow Be?

A cow on her first calf and which has been broken in to be milked in a bail is probably the best type for average needs. Older cows, in general, produce more milk but require to be replaced sooner than young cows.

It is advisable that the intended purchase be examined by a veterinary surgeon for the presence of mastitis (chronic inflammation of the udder), which decreases milk production, and also be tested for tuberculosis and brucellosis.

What Breed of Cow?

Jersey cattle are the most suitable for house cows. They are quiet, good grazers and produce the richest milk. A good Jersey should average 2 gallons of milk per day when properly fed.

Jerseys Make Very Suitable House Cows.

They are quiet, good grazers and produce rich milk.

How Long Will a Cow Milk?

If mated at the proper time, milk production is fairly low by 9 to 10 months after calving.

When Should a Cow be Mated?

Cows first come on heat about four weeks after calving and return about every three weeks. They should be mated about 2 to 3 months after calving. Heat is evidenced by excitement—the cow bellowing and endeavouring to mount other cows. Arrangements should be made to have the cow taken to the bull a few days before heat is expected.

How Are Cows Dried Off?

Unless milk production is still fairly high, cows are most easily dried off by completely ceasing milking. During the drying-off period concentrates should be eliminated from the diet and access to succulent feed restricted; preferably only cereal hay or chaff should be given. If production is high, milking once daily until production is below 2 gallons can be practised and then milking should cease. After a few days the udder will commence to shrink, indicating re-absorption of the milk into the system.

What Care is Necessary Before and at Calving?

Good feed must be given to the cow during the dry period if milk production is to be satisfactory after calving. Cows should calve in good condition. If pasture is good, supplement with 2 to 3 lb. per day of a good concentrate mixture such as two parts by weight of crushed oats, one part bran and one part linseed meal.

If possible, the cow should calve in a clean, grassy paddock. Most cows require no assistance, but if some difficulty is apparent, contact a veterinary surgeon immediately.

What are the Main Points about Milking?

Long hair on the udder and belly near the udder should be clipped. The udder and teats should be wiped with a rag damped in water containing some chlorine disinfectant. The use of a lubricant, such as vaseline, on the teats is preferable to the common practice of using milk. It is cleaner and will keep the teats in better condition.

Milking should be done twice daily, without causing any excitement which will prevent cows letting their milk down.

Clean buckets are essential for clean milking. Straining immediately after milking is advisable to remove any hairs, etc., which may have fallen into the milk. Straining should be done through proper cotton wool filter pads.

How Should the Cow be Fed?

The main points concerning feeding are:

(1) Good pasture, *i.e.*, an abundant growth of short, leafy grasses and clovers is the best feed for dairy cattle, and if there is sufficient of this type of grazing, no other type of feed is necessary. However, this is an unusual occurrence. The merits of improved pasture should be considered.

(2) Where it is impracticable to grow fodder crops reliance must be placed on bought feeds. Suitable feeds are:—Oaten chaff, lucerne chaff, crushed maize, crushed wheat, crushed barley, crushed oats, crushed grain sorghum, bran, pollard, linseed meal, peanut meal and coconut meal. Where fodder crops can be grown, oats, lucerne, Japanese millet, maize or sweet sorghum might be considered. Grazing on oats is a particularly valuable method of winter feeding if other roughage is given as well.

(3) All rations must contain some roughage, *i.e.*, pasture, chaff or hay. Chaffs and hays are usually dear sources of food matter, and therefore should be used in limited amounts. Preferably, about 14 lb. per day should be given, but this may be reduced safely to 8 or 10 lb.

(4) The type of chaff or hay will influence the type of concentrates.

(*a*) Lucerne chaff and hay (high protein roughages) only require low protein concentrates. Suitable feeds to use with lucerne are:—Crushed maize, crushed wheat, crushed barley, crushed oats, crushed grain sorghum, bran or pollard. A mixture of about three parts crushed grain to one part bran is very suitable. Feeds such as linseed and peanut meal are unnecessary with lucerne unless it is very poor quality, *i.e.*, very stalky and with little leaf. Crushed wheat (wheatmeal) should be fed with care as it may produce digestive disorders. Do not use it as more than one-third of the mixture and if used alone mix thoroughly with roughage fed.

(*b*) Oaten and wheaten chaff need high protein concentrates. Suitable mixtures (all parts by weight) are:—

Crushed grains (crushed maize, crushed wheat, crushed barley, crushed oats, crushed grain sorghum), three parts; linseed meal, two parts.

Crushed grain, one part; bran or pollard, one part; linseed meal, one part.

Crushed grain, four parts; peanut meal, one part.

(5) Feed concentrates at the rate of about 4 to 5 lb. per gallon of milk per day. If a cow is giving 2 gallons of milk per day, the daily ration might be:—

Lucerne chaff or hay, 14 lb.; concentrates, 8-10 lb. (*e.g.*, mixture of three parts crushed grain and one part bran)

or

Oaten or wheaten chaff, 14 lb.; concentrates (*e.g.*, mixture of crushed grain three parts and linseed meal two parts), 8-10 lb.

Give the feed in two equal feeds daily.

Where oaten or wheaten chaff is fed, cattle should get some green grazing. If there is no grazing, some lucerne chaff must be fed.

What Licks Should Be Provided?

Coarse salt should always be available for the cow. When the cow is fed largely on concentrates with little roughage, or only cereal roughages, such as oaten or wheaten chaff, feed sterilised bone meal. A sound practice is to feed salt and bone meal at the rate of 1 lb. of each per 100 lb. concentrates fed, adding 1 lb. ground limestone where lucerne is not fed.

What Common Diseases Might Be Expected?

Mastitis (inflammation of the udder) is the commonest disease of dairy cattle. It is evidenced by hardness and swelling of one quarter or more of the udder, and production of milk which may be thickened or containing clots. Hot fomentations and massage are helpful, but treatment by a veterinary surgeon is indicated.

How Should the Calf be Reared?

The calf may be left with the cow for the first week and then put with her two or three times a day for short periods so that all the milk is not taken by the calf. At two weeks, provide the calf with a mixture of concentrates such as suggested for feeding the adult cow when supplementing lucerne chaff. If there is no short, leafy grazing, provide lucerne chaff.

Alternatively, the calf may be taken off the cow after the first 24 to 48 hours and taught to drink from a bucket by placing a milk-covered finger in the calf's mouth, and while the calf is sucking, lowering the hand into the milk. The calf should then be fed twice a day on whole milk, being given about ¾ to 1 gallon per day, depending upon the size of the calf.

At two weeks, introduce concentrates and hay as above and gradually reduce the amount of whole milk till three or four months old, when no further milk need be given. If separated milk is available, continue with some whole milk until about six weeks, gradually replacing it with separated milk.

When Should a Heifer be Mated?

If the calf is reared to maturity, it may be mated at from fifteen to eighteen months depending on its development. The gestation period is about nine months nine days.

What of Water Supply, Shade and Shelter?

Ample water should always be available for the cow. Shade from hot sun and shelter from cold winds and rain should be available. Rugging is desirable in cold climates.

Insect Pests—*continued from page* 479.

of each ear should be treated about five days after they appear; cost of treatment, however, generally would be considered excessive. Areas cropped with maize and sweet corn should be ploughed and harrowed during the winter, to destroy as many as possible of the over-wintering pupae in the soil.

POULTRY NOTES

THE POULTRY INDUSTRY IN OTHER COUNTRIES.

A Review of Present and Potential Production.

E. Hadlington, Principal Livestock Officer (Poultry).

POULTRY farmers endeavouring to increase production of eggs for export to Britain will be interested in a statement on the current poultry situation and outlook in Europe and North American countries, prepared by the Food and Agriculture Organisation of the United Nations and published in "F.A.O. Commodity Series No. 5," early this year.

The figures quoted show that in most European countries egg production in 1947 was considerably below pre-war levels, and that restoration of flocks in those countries will be largely dependent upon availability of poultry foodstuffs. In the United States of America and Canada, however, production has expanded greatly.

The position disclosed indicates that there should be an assured outlet for all the eggs of suitable quality which Australia can produce during the next few years.

It is unfortunate that the coal shortage disorganised wheat supplies to the poultry industry in this State just at the most critical period of the year when the young stock were being raised, and this has already resulted in some reduction in hatchings. Although the restoration of wheat deliveries has been promised, it is now somewhat late to make up any leeway in rearing operations.

The following extracts are taken from the F.A.O. publication referred to:

Current Situation and Outlook.

By mid-1947, poultry numbers in central and western Europe were at approximately 75 per cent. of the average level for the years immediately preceding World War II. The unfavourable 1947 harvests are likely to permit very little improvement before mid-1948, but most countries plan for a rapid increase to poultry levels exceeding those of the pre-war period as soon as grain supplies return to something like normal. In estimates presented to the Committee of European Economic Co-operation, the participating countries envisaged an increase of approximately 10 per cent. over pre-war numbers by 1949-50, assuming adequate feed imports. For western Germany, however, it was anticipated that

the grain shortage would persist at least through 1950-51, and that poultry numbers by that time could increase to only about 60 per cent. of the pre-war level from their present level of less than 50 per cent. of pre-war. As is shown by the experience of a few countries in the years immediately following the war, poultry numbers respond very rapidly to improvements in the supply of grain. Progress in the coming years, therefore, will depend directly upon the rapidity with which European grain supplies are restored.

In the United States the number of chickens on farms as of 1st January, 1947, was 475.4 million. By 1st January, 1948, this number had declined by 1 per cent., and some further decline is probable by 1st January, 1949, because of the grain shortage. In Canada, chicken numbers on farms increased from 76.9 million in 1946 to 83.9 million on 1st June, 1947, an increase of 9 per cent. Although the feed shortage will probably cause some reduction in 1948, the decrease may be less marked than in the United States in view of egg and poultry contract commitments to the United Kingdom.

The future pattern of trade in poultry and eggs will be determined by the success of the European recovery program, and in particular by developments in the United Kingdom's trading position. In the import programs outlined in the Report of the Committee of European Economic Co-operation, only the United Kingdom contemplates large imports of eggs and egg products. Its program shows annual imports as continuing at approximately the current level (300,000 metric tons in shell-egg equivalent) through 1950-51. If imports are maintained at this level and if the hoped-for increase to 185 per cent. of pre-war poultry numbers is achieved, consumption in the United Kingdom should rise to 116 per cent. of the pre-war level by 1950-51. The United Kingdom has current long-term egg agreements with Canada, Australia, Ireland, and Denmark.

In other European countries, current supplies will, in general, permit consumption at around two-thirds of the pre-war level. Only in Ireland and Denmark will consumption equal or exceed the pre-war average. In Germany the level may be about one-third of pre-war In the United States and Canada a high level is likely to continue in 1948, but with some decline from 1946-47.

Chicken Numbers.

In the period between the two World Wars, chicken numbers in most parts of the world showed steady expansion. With very few exceptions, European countries all shared in this expansion. The greatest increases, however, occurred in those countries where specialized poultry-raising based on grain-feeding and production for export was developing. In Denmark, numbers in 1939 were 75 per cent. above the 1926-28 average, and in the Netherlands they had doubled. Expansion in the United Kingdom approximated 36 per cent., and Germany 25 per cent.

In the United States, which is by far the leading poultry producer, the increase in total numbers was slight up to 1933, and in 1934 there was a heavy setback, due largely to drought. Chicken numbers fell from 434 million on 1st January, 1934, to 390 million on 1st January, 1935. A recovery to 438 million, however, had been made by 1st January, 1940. In Canada a corresponding, but much less pronounced, decline and recovery occurred during these years.

During the war years, restricted grain supplies for poultry feeding necessitated heavy reductions in flocks in most European countries, the greatest percentage decreases occurring in countries where specialized production was most developed and where it depended on imports of grain. In Denmark, numbers declined by two-thirds between 1939 and 1942, the low point of the war years. Some later recovery was made with better grain crops, but chicken numbers in Denmark at the end of the war were only one-half those of 1939. In the Netherlands, numbers fell from 32.8 million in 1939 to 3.9 million in 1943. In Norway, the number of adult fowls declined from 3.4 million in 1939 to less than one million in 1945. The decrease in Sweden exceeded one-third in 1942, but better grain crops subsequently permitted a rapid recovery, and numbers at the end of the war stood at 88 per cent. of the pre-war average. Germany ended the war with 46 per cent. of its pre-war numbers. In the United Kingdom the low point was reached in 1943, when

numbers stood at 66 per cent. of the 1939 figure. The contraction in specialized poultry-raising was more severe than this, however, because of the very restricted rations permitted to poultry keepers. Serious reductions took place also in the devastated countries of eastern and south-eastern Europe. In Poland, numbers in 1945 were only 6.5 million compared with approximately 70 million on the eve of the war in the territory within present boundaries. Reductions approaching one-third or more were reported from Yugoslavia, Greece, Rumania, and Hungary. Poultry diseases accounted for part of these declines.

Recovery in European poultry numbers became generally apparent in 1946 and 1947, and total numbers are estimated to have reached 65 to 70 per cent. of the pre-war level. The rate of recovery, however, has varied widely from country to country. By 1946, numbers in Sweden were again at 100 per cent. of the pre-war level. In Norway they had recovered to only one-half of pre-war. In Denmark, numbers reached two-thirds of pre-war by 1946, with a slight improvement later. In the United Kingdom numbers had recovered to about 83 per cent. of pre-war in 1946, and, it is estimated, to about 88 per cent. in 1947. Only moderate post-war advances occurred in Ireland (where, however, the wartime decline was also very slight), Germany, Austria, Greece, and Bulgaria.

In the United States, poultry numbers increased outstandingly during the war period under the influence of high demand and large supplies of concentrated feed-stuffs. The highest point was reached in 1943, with numbers at 582 million as compared with 438 million on 1st January, 1940. Thereafter, some adjustment occurred in response to changes in the feed supply and the decline in the export demand on which the previous expansion had been partly based.

In Canada an even more marked expansion during the war years brought chicken numbers from 57 million in 1939 to 80 million in 1944, an increase of 40 per cent. This remarkable increase was stimulated by Government policy aimed at an expanded livestock production in order to utilize the large grain supplies resulting from the decline in shipments and to provide foodstuffs for the United Kingdom. Some reduction from the high wartime peak of 1944 occurred in 1946, the numbers being about 77 million for that year. By 1947, however, they had risen to 84 million, largely to meet export commitments to the United Kingdom.

Production of Eggs.

During the war years, egg production in the United States and Canada increased tremendously. In 1944 these two countries together produced over 62 thousand million eggs as against their 1934-38 combined average of 38 thousand million. Although the 1944 figure is the high point, the output for several other years approached it, and production was consistently high throughout the war years.

In the major producing countries of Europe, however, the wartime decrease was very great. As in chicken numbers, there was a sharp drop in production in the early years of the war, and then a gradual decrease as feed supplies grew shorter. The lowest point was reached for most European countries in 1944. By 1945 recovery had begun in most of the Allied countries, but production continued to decline in Austria, Germany, and Italy. In 1946, all European countries for which statistics are available showed continued recovery except Austria, where egg production declined from 33.1 per cent. of pre-war in 1945 to 28 per cent. in 1946. Sweden, Ireland, and Turkey exceeded their own 1934-38 averages in 1946, but Norway, Finland, Denmark, the Netherlands, and Czecoslovakia were still more than 50 per cent. below their pre-war levels.

Rough estimates of post-war egg production show that the world total had recovered to approximately 85 per cent. of the 1934-38 average by 1945 and to between 85 and 90 per cent. by 1946. European production had reached between 65 and 70 per cent. of the pre-war level in 1945 and between 70 and 75 per cent. in 1946. A number of European countries had contemplated increases in poultry numbers and egg production during 1947 and 1948 and preliminary estimates for 1947 showed actual increases for most countries, but the extreme shortage of grain supplies in the current crop year will delay these plans and in some countries may necessitate a reduction in flocks.

The trend of egg production, since the war, for a selected number of countries is compared with pre-war production in the accompanying table.

EGG PRODUCTION FOR SELECTED COUNTRIES.

Country.	1934–38.	1946.	Estimated 1947.
	Millions.	Millions.	Millions.
Austria	715	200	......
Czechoslovakia	1,958	800	(a) 1,025
Denmark	1,987	912	(a) 1,000
Germany	*5,915	*1,900	......
Ireland	1,073	*1,080	(b) 884
Italy	5,710	*3,200	(c) 3,780
Switzerland	423	280	(a) 300
United Kingdom—			
Total	5,098	3,850	(a) 3,964
Farm	3,871	2,418	(a) 2,505
Canada	2,638	4,162	(a) 4,680
United States	35,498	55,662	(a) 54,000

SOURCE: 1934–38 and 1946 figures, unless otherwise specified, from F.A.O. Yearbook of Food and Agricultural Statistics, 1947 (in process).

* Unofficial estimate.

(a) U.S. Department of Agriculture, Foreign Crops and Markets, 6 Oct., 1947.

(b) U.S. Department of State, Publication 2952, European Series 29 (Committee of European Economic Co-operation), Volume II, Table 78, Average of estimates for two years 1946–47 and 1947–48, using 17,000 eggs per metric ton for conversion.

(c) *Ibid.* Average of two years 1946–47 and 1947–48 using 18,000 eggs per metric ton for conversion.

Yields per Hen.

In the late 1930's, yields of eggs per hen in western European countries ranged from 110 to 135, most countries showing a steady improvement after the introduction of better laying strains. During the following years, up to 1946, there was a general decline in rates of yield as a result of the deterioration in both quantity and quality of feed supplies. This decline, however, was not of great proportions in those countries for which records are available, and there were some significant exceptions. In the enforced reduction in poultry numbers, farmers tended to cull with the object of retaining the best layers, and this process of selection exerted some offsetting influence in maintaining yields.

Among European countries, Ireland and Belgium showed some increases in the rate of yield in 1946 as compared with pre-war. In the United Kingdom there was a decrease from a pre-war annual average of 128 eggs per hen to an average of 102 in 1946, caused by a decline in feed supplies and by a marked curtailment in specialized poultry production during the war years.

In the United States and Canada, greater efficiency in poultry husbandry was developed during the war years, and the manufacture and use of scientific feeds were greatly expanded. The increase in average yields has been conspicuous in both countries. The pre-war average yield per hen in the United States was 97 eggs a year. There was a steady rise during the war years, and by 1947 the average was 125. This upward trend in productivity is expected to continue through 1948. In Canada the average in 1946 had risen to 119 as compared with a pre-war average of 110 eggs.

The Clean Egg Competition

CONDUCTED BY EGG PRODUCERS' COUNCIL.

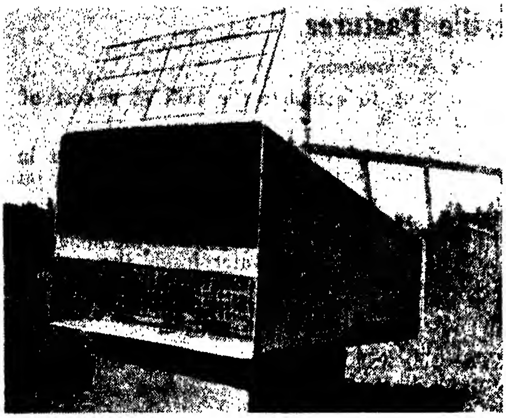
Winner in N.S.W. Section.*

THE Egg Producers' Council Clean Egg Competition aroused much interest in the poultry industry, and many inquiries have been received for particulars of the winning entry, which was submitted by Mr. W. K. Field, 52 Railway Parade, Riverstone.

The entry comprised a design for a nest so constructed that the egg, when laid, rolls gently down a sloping wire floor into a separate compartment—where it is away from contact with the feet of any hen subsequently visiting the nest, and where it commences to cool at once.

Measurements of a nest of this design are as follows: 24 inches wide, 27 inches in depth (front to back), 17 inches high at the entrance inside the house and 9 inches high at the rear. The woven wire floor, which is of ½-inch mesh, is 5½ inches above the floor (or base) at the entrance, is 23 inches in depth, and slopes to the rear, finishing 4 inches from the back of the nest and 1½ inches above the base. The area remaining at the back consists of a tray or egg receiving box. It is recommended that this tray

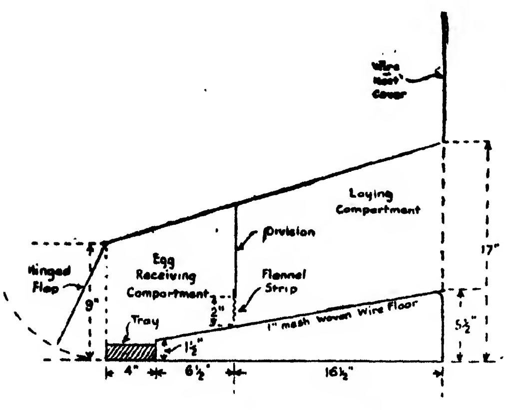
* Details supplied by the Secretary, Egg Producers' Council.



Nest Made of Galvanised Iron to the Winning Design.
View of the entrance (inside the house).

be filled to the level of the wire floor with shell grit or other material to cushion the egg after it rolls down the slope.

In the interior of the nest and 16½ inches from the front is placed a division which reaches from the top to within 2 inches of the wire floor; this area is regarded as the laying quarters. Flannel is fastened to this division to reach nearly to the wire floor, so that when the egg rolls through the 2 inch opening the hen cannot see it and will not, therefore, try and drag it back again. It is important that this space into which the egg rolls, *i.e.*, the remainder of the wire floor and the egg receiving box be 10½ inches wide. The rear wall of the nest is hinged at the top so that the flap can be raised for collection of eggs, and a wire frame is lowered, at night, over the entrance (inside the shed) to prevent the birds perching in the nests.

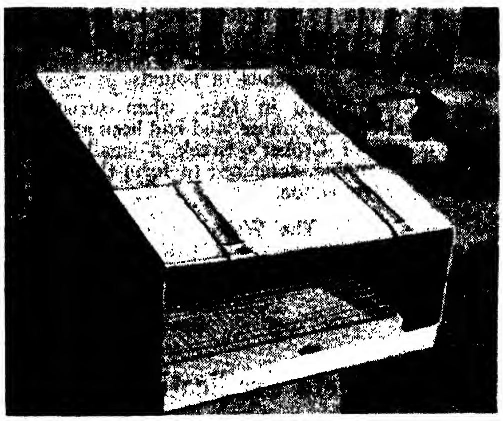


Sketch showing Cross Section of Nest.

A record kept by Mr. Field of the results from a pen of thirty hens using this type of nest showed that over a period of fourteen days, 262 eggs were laid—251 in the nest (two of these having very thin shells) and eleven either in the run or in the shed.

A test was made (unknown to Mr. Field) of a subsequent consignment of one 30 dozen case of eggs from these nests, the eggs being carefully candled to ascertain any faults present. The candling supervisor's comments were:—

"This consignment was practically perfect; the external condition the best seen. Eight eggs showed slight signs of an abrasive substance being used, but such signs were not detrimental in any way, the remainder still having the full bloom of an unwashed, fresh egg. One egg was broken,



Rear View of Galvanised Iron Nest.
Note the woven wire floor of rear compartment and the tray into which the eggs roll.

three were classed as 'vein cracks', and the remaining twenty-nine 8/12 dozen were of perfect export quality."

Practically any material can be used in manufacture of the nest, but galvanised iron or fibro would be most suitable for vermin control.

As the Egg Producers' Council intends to issue a booklet embodying all the winning designs, it is suggested that any large scale manufacture of new nests be delayed until this information is available. The other designs may prove more acceptable for installation in existing shedding.

Salt Swamps to Fertile Pastures.

Oxley Island Drainage Union's Achievement.

THROUGH a self-organised drainage union, corporate under the Drainage Act, 1939-40, dairy farmers on Oxley Island on the Manning River have reclaimed hundreds of acres of tidal swamp for pasture and cultivation. This work has been done over a period of years, by means of a widespread drainage scheme which involved construction of a weir to prevent salt-water tidal floodings on the land of the farmers concerned.

Details of this remarkable achievement by locality effort were the subject of a talk by Mr. Bruce Cowan, honorary secretary of the Oxley Island Drainage Union, at a recent Agricultural Bureau Youth School.

The results of the undertaking have proved even more successful than originally expected. Out of approximately 475 acres of once useless swampy flats (in parts covered feet deep with salt water and dangerously boggy to stock) approximately 330 acres now grow fertile pastures of white clover, couch and paspalum, or produce good fodder crops. On some reclaimed land agricultural lime was used, and with markedly beneficial results. The undertaking has not only increased production on the island, but has increased the value of the farms involved in the scheme by some thousands of pounds.

The project began in 1932, when seventeen Oxley Island farmers whose land had been affected by the waters of Croker's Creek, a small tributary of the Manning, combined to form the Oxley Island Drainage Union.

The Weir.

A weir was erected about half a mile from the mouth of the creek; it took about ten men nine months to complete the task at a cost of nearly £2,000.

The floodgate consists of five pipes, 4 feet in diameter, each with a reinforced concrete door on the outflow side of the weir, swung on hinges. These doors, or "tidal flaps," fit over the outlets of the pipes. The principle by which the floodgate works is simple: when water inside the weir is at a higher level than outside, it forces the gates open and runs out. There is seldom, therefore, any water at all inside the weir.

The weir was built also to serve the island as a roadway.

The Drainage System.

Land was surveyed to determine the acreage affected by the tidal waters, and the lowest parts of this land were pegged for construction of drains.

A main drain, 12 feet wide at the top, with an average depth of 3 feet, was constructed stretching approximately four miles inland from the floodgate; also numerous smaller branch drains.

Landowners are rated by their self-organised Drainage Union each year on a certain percentage of the improved value of their land under drainage, plus a percentage of the increased annual value.

The yearly income of the Union is small—about £232—but since 1932 the Union has not only maintained the necessary upkeep work on drains and the weir, but has practically freed itself of debt.

Complete Eradication of Insect Pests is Virtually Impossible

COMPLETE eradication of any insect pest is virtually impossible since, in effect, it means killing every female insect of the species, capable of laying eggs—and it can be readily imagined how difficult, if not impossible, this would be.

On the other hand, reduction of insect pests by appropriate control measures to levels at which they can do no serious damage to crops is common in New South Wales, and effects a considerable annual saving to the State.

From time to time requests are made by primary producers that some pest be eradicated, whether it be an introduced or native species. In urging eradication these producers are apparently under the impression that the pest can be so effectively treated that it will cease forever to be a pest in the country.

Many landowners and pastoralists hold this viewpoint in regard to the grasshopper. At a recent conference the opinion was expressed that poisoned bran was useless because it did not eradicate the grasshopper; as evidence of this it was pointed out that poisoned bran bait has been used in the United States for many years, and grasshoppers continue to appear in plague numbers in that country.

Value of Control Campaigns.

What has been overlooked at this conference is the very great value to United States primary producers (in crops and pastures saved) of the use of poisoned bran for grasshopper control. An instance of this is contained in a recent report by Entomologists in charge of this work in the United States.

They state that in 1939, the United States Department of Agriculture estimated that, because of the control measures carried out in the United States the previous year, value of crops saved amounted to A.£47,051,371; that loss caused by grasshoppers had been A.£22,357,794; and that the cost of the control campaign had been A.£599,223.

It was estimated that for every dollar spent during that period, 79 dollars had been saved.—ENTOMOLOGICAL BRANCH.

USEFUL POTATO RECIPES.

MANY useful ways of using potatoes were described to a Special Women's Session at the recent State Conference of the Agricultural Bureau, by Mrs. W. E. Schowe, Lecturer in Home Science at the Australian Missionary College, Cooranbong.

Some of these recipes are listed below and should be of interest to farm women-folk generally.

Stuffed Baked Potatoes.

Select large potatoes, scrub and bake. Cut in halves lengthwise. Scoop out inside carefully. Mash thoroughly, add a little milk, 1 tablespoon butter, ¼ cup cheese and ½ teaspoon salt for 2 potatoes. Pile mixture lightly into shells. Sprinkle with grated cheese. Return to oven. Bake until slightly brown.

Scalloped Potatoes.

Material:—

6 medium potatoes.
2 tablespoons wheatmeal or white flour.
4 tablespoons butter.
Milk.
Salt.

Method.—Pare potatoes, slice and place in buttered baking dish in layers covering each layer with a sprinkle of flour, dots of butter, salt. Chopped onion may be added if liked. Cover with milk. Bake in moderate oven 350 deg. about 1 hour. Cooked potatoes may be used and hard boiled eggs may be added in layers.

Candied Sweet Potatoes.

Material:—

6 sweet potatoes.
Butter.
1 cup brown sugar.
Salt.

Method.—Boil potatoes in skins until nearly soft. Remove skin, cut into thick slices. Place in flat buttered baking dish. Sprinkle with sugar, dot with butter, add salt. Bake in quick oven 400-450 deg. until brown. They may be turned.

Creamed Potatoes.

Material:—

2 cups diced cold potatoes.
Salt.
1½ cups cream sauce.
Chopped chives or parsley.

Method.—Make cream sauce by melting 1 tablespoon butter, add 1 tablespoon flour and 1 cup milk when mixture is bubbling. Add salt last. Stir until the sauce thickens. Add potatoes and heat thoroughly. Add chives or parsley.

Hashed Potatoes.

Four cold potatoes chopped finely. Add salt and 1½ tablespoons flour. Mix well. Heat frying pan, add 2 tablespoons butter and when hot, add potatoes, packing down firmly into the pan. Add 2 tablespoons milk, cover and let brown well. Remove from pan like an omelet in a roll. Garnish with parsley.

Brown Cream Gravy.

Two tablespoons cream. Brown in frying pan until fat separates from casein. Stir often. Add 1 tablespoon flour. Mix well. Add 1 cup potato water. Stir and cook until thickens. Add 1 teaspoon marmite.

Potato Salad.

Diced cold boiled potatoes. Add chopped onion and chopped celery if liked, also chopped hard boiled eggs. Mix with salad dressing, add salt. Serve on lettuce leaves. Garnish with sliced hard boiled eggs.

Boiled Salad Dressing.

Material:—

1½ cups milk.
2 tablespoons flour.
½ teaspoon celery salt.
1-3rd cup lemon juice.
2 tablespoons sugar.
2 egg yolks.
½ teaspoon onion salt.
2 tablespoons butter.

Method.—Heat milk in double boiler. Add flour, sugar, salt well mixed together. Stir and cook 15-20 minutes. Add yolks well beaten and cook 3 minutes. Remove from fire, add butter and when cool, add lemon juice. Keep in refrigerator.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis free Herd Scheme (Swine) The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals will be accepted for inclusion in the list A charge will be made for the work since the inclusion of a herd in this list should be of benefit to the owner After a herd has been accredited, two semi-annual tests will be required and thereafter annual tests provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present

Registered Stud Herds.

Anderson, W T C, Dearborn Stud Castlereagh Rd, Penrith
Bathurst Experiment Farm Bathurst
Boardman, C O, ' Fairview, ' Camden
Campbell, D, ' Hillangrove ' Wamberal, via Gosford
Cocks, F D, " Condalarra," Miranda
Croft F, Lugwardine, Kentucky
Draper R E Glengar ' Capertee
" Endeavour Stud, Camp Mackay, Kurrajong
Farrer Memorial Agricultural High School Nemingha
Foley J B Gundurimba Road Loftville, via Lismore
Garrison Battalion (2nd), Manly
Gladesville Mental Hospital
Grafton Experiment Farm, Grafton
Harris, K H Pennant Stud Piggery, Purchase Road, West Pennant Hills
Hawkesbury Agricultural College, Richmond
Holland, A L, Argonne, Tubbul
Hurlstone Agricultural High School Glenfield
McCrumm, ' Strathfield " Walla Walla
Nemingha State Hospital and Home
New England Experiment Farm Glen Innes
Newington State Hospital and Home, Newington
Ricketts Mrs H I " Mangus," Young
Riverina Welfare Farm Yanco
Rydalmere Mental Hospital
Shirley G F ' Camelot," Penrith
Skarratt A C, Riverstone
Upston H E Wattle Tree Road, Holgate via Gosford.
Wagga Experiment Farm Wagga
Walker J R, ' Strathdoon," Wolseley Park
White A N, Blakeney Stud Orange
Williams, G R B, Gwandalan ' Grenfell
Wollongbar Experiment Farm, Wollongbar
Yanco Agricultural High School

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst
Brookfield Afforestation Camp, Mannus
Callan Park Mental Hospital Callan Park, Rozelle
Emu Plains Prison Farm
Glen Innes Prison Camp, Glen Innes
Gosford Farm Home for Boys, Gosford
Goulburn Reformatory, Goulburn
Kenmore Mental Hospital
Lidcombe State Hospital
Morisset Mental Hospital, Morisset
Orange Mental Hospital
Parramatta Gaol Parramatta
Parramatta Mental Hospital
Peat and Milson Islands Mental Hospital Hawkesbury River
Stockton Mental Hospital
Waterfall Sanatorium, Waterfall

Abortion-free Herds.

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free —

Owner and Address	Number in herd
Registered Stud Herds	
Bathurst Experiment Farm (Guernseys)	46
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A I S)	64
Dixon, R C, Elwatan " Castle Hill (Jerseys)	30
Fairbairn & Co, C P, Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A I S)	49
Forster, N L, Abington, Armidafe (Aberdeen Angus)	121
Hawkesbury Agricultural College, Richmond (Jerseys)	106
Hicks Bros, ' Meryla, ' Culcairn (A I S)	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
McEachern, H, " Nundi," Tarcutta (Red Poll)	62
McSweeney, W J, ' The Rivers," Canowindra (Beef Shorthorns)	75
Murray Wilcox, R, " Yalalunga," Willow Tree Road, Quirindi (Herefords)	97
Mutton, T, " Jerseymead " Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)	49
New England University College, Armidale (Jerseys)	18
Peel River Land & Mineral Co, Tamworth (Beef Short horns)	102
Raper, W R, Calool, Culcairn (Beef Shorthorns)	103
Reid, D B, " Evandale," Sutton Forest (Aberdeen-Angus)	35
Reid, G T, " Narengullen," Yass (Aberdeen-Angus)	276
Robertson, D H, " Turanville," Scone (Polled Beef Shorthorns)	114
Salway, A. E, Cobargo (Stud Jerseys)	57
Scott, A. W, " Milong," Young (Aberdeen-Angus)	112
Simpson, F. S., " Gunnawarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S)	161
Trangie Experiment Farm, Trangie (Aberdeen Angus)	170
Von Nida F F, Wildes Meadow	30
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas R, Strathdoon, ' Wolseley Park (Red Polls)	57
White, H F, and Sons, Bald Blair, Guyra (Aberdeen Angus)	23
Whitelaw, L A, ' Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	67
Yanco Experiment Farm	89
Young A, Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callen Park Mental Hospital	50
Cullen Ward, A R, " Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	32
Forster, T. L, and Sons, " Abington," Armidale	69
Freudenstein, W. G A & F J, " Chippendale," Grenfell Rd, Young	56
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, " Yaralla " Herd	94
Rydalmere Mental Hospital, Rydalmere	69
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	35

W L HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.) ...	120	13/11/48
Bradley, H. F., "Nardoo," Ashford Road Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.) ...	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm	55	9/6/48
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	74	2/2/49
Limond Bros., Morisset (Ayrshires)	66	15/7/49
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	49	8/5/49
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys)	94	27/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys) ...	119	20/4/48
Yanco Agricultural High School, Yanco (Jerseys)	74	18/3/48
Yanco Experiment Farm (Jerseys)	91	14/10/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle ...	51	20/4/49
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus ...	209	12/8/48
Burns, R., "Wilga Glen," Coonamble ...	20	24/12/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell	32	11/8/48
Coventry Home, Armidale	11	29/9/48
Daley, A. E., "Siton," Oakwood Rd., Inverell	14	14/5/49
Daley, A. J., Lealands, Inverell	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell ...	34	5/4/49
Ebsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	141	23/4/49
Fairbridge Farm School, Molong	33	9/4/49
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	27/4/49
Frizelle, W. J., Rosentein Dairy, Inverell ...	111	9/9/48
Genge, G. L., Euston, Armidale	36	22/9/48
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood ...	22	20/5/48
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	34	22/9/48
Ince, W. G., Kirkwood St., Armidale ...	11	12/4/49
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	34	22/9/48
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	17/6/49
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	40	20/11/48
McCosker, E., "Bannockburn Station," Inverell	46	14/5/49
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
McMillan, N., Duval Road, Armidale ...	30	29/9/48
MacNamara, B., "Mount View," Cessnock...	67	21/5/49
Marist Bros. College, Campbelltown ...	82	23/1/49
Mason, A., Killarney, Armidale	33	30/9/48
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Mullholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville ...	45	5/2/49
O'Brien, O., "Mount View," Inverell ...	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
Rolfe, A. E., "Avon Dale," Inverell ...	22	14/5/49
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	8	12/7/49
St. John's Hostel, Armidale	6	24/6/49
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills ...	29	11/6/49
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boys' Home, Westmead ...	30	9/7/49
State Penitentiary, Long Bay	14	27/11/49

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.	Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*			Waddell, W., "Afton," Oakwood Rd., Inverell	127	5/7/49
			Waters, A., Marsh Street, Armidale	2	13/10/48
Stephenson, W. J., "Hill View," Fig Tree ...	54	5/4/49	Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48
Tanner, F. S. Dural Rd., Armidale	28	30/9/48	Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Tombs, E. S., Box 76 P.O., Armidale ...	33	30/9/48	Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Tombs, P. C., Kellys Plains, Armidale ...	49	29/9/48	Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
Tombs, R., Harlwood, Armidale	40	22/9/48	William Thompson Masonic School, Baulkham Hills	55	27/4/49
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48	Williams, L. B., "Birida," Armidale ..	39	12/4/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49	Youth Welfare Association of Australia ...	171	14/4/49
Ursuline Convent, Armidale	5	7/10/48			
Von Frankenberg, F. E. "Spring Hills," Camden	68	12/12/48			

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry

Immunisation of Young Dogs Against Distemper.

"JUST recently I have lost three of my best sheep dogs and have been told they died from distemper. I understand young dogs can be immunised against this disease. Can you tell me something of this condition, particularly with reference to immunisation?"

Replying to the above inquiry, a veterinary officer of the Department of Agriculture advised:

"Distemper is an infectious disease caused by a virus—an organism so small that it cannot be seen by the ordinary microscope. It is usually contracted through contact with infected dogs, dingoes and infected kennels.

"At the outset, the symptoms are difficult to recognise. There is a slight dullness, and the dog is not as eager as usual for his feed. After a day or so, he becomes sore in the eyes and a discharge appears. By this time the animal is quite dull, lies about a good deal, and may refuse food entirely.

"The matter of treatment at this stage is relatively simple, but it quickly becomes difficult and, perhaps, hopeless as the animal contracts the many complications associated with the disease. Weakened in resistance, it may contract bronchitis, pneumonia, bowel trouble, ear and nervous complications, which in most cases cause heavy mortality. Even though one attack of distemper gives a dog life-long immunity, often it is left with permanent disabilities such as general weakness or nervous fits.

"These complications can be prevented by the modern technique of immunisation, and therefore anyone who breeds valuable dogs is well advised to have them immunised when they are about three months old.

"This immunisation is done by giving the dog a fixed dose of the live distemper virus, and then controlling its effect by anti-distemper serum, thus building up the immunity and resistance of the animal without endangering it to the harmful effects which usually follow natural attacks. Immunity built up in this manner will, in nearly every case, last for the lifetime of the animal.

"You may ask: why not allow the young animal to catch distemper naturally and then treat it in the early stages? There would always be the risk that the animal might be very susceptible, and as the dose of the infective virus would be unknown, the veterinarian would be handicapped in treatment of the animal.

"It is pointed out that there is some degree of risk in immunisation, and therefore it should be left to your veterinary practitioner to carry it out, as he is the person equipped with the necessary knowledge."

Editorial—

Don't Gamble.

Conserve Fodder.

ONE drought in New South Wales caused losses to our stockowners—and consequently to the State—of 11,000,000 sheep, 500,000 other stock, and £1,500,000 worth of dairy products. These were in addition to indirect losses amounting to millions of pounds, the most obvious of which were losses of natural increase (lambs, calves, etc.), from stock which starved to death, impairment of breeding and production capacities of stock which survived, lowered resistance to disease, and substantial reduction in farm income whilst re-stocking.

These facts were stated by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) in announcing the Fodder Conservation drive launched last month by the New South Wales Stock Fodder Conservation Committee in collaboration with the Department of Agriculture. They emphasise the element of insecurity that will continue to threaten our livestock industry until farmers adopt fodder conservation as an essential routine practice.

Drought losses are *staggering*! Less spectacular, yet just as staggering in their total, are the losses in production, if not in stock, occasioned by feed scarcity practically every winter and very often during other seasons of the year.

The element of risk in stock farming, particularly in the dairy industry, is far too great to be accepted without grave concern. No industry or business can stand up to such losses and remain solvent. No industry or business can plan, with any degree of certainty, for future expansion when risks like those are ever-present.

Adequate reserves of fodder on every farm on which livestock are run would be tantamount to insuring against all losses, direct and indirect, caused by drought years and other periods of feed scarcity. Fodder conservation is the wisest and cheapest form of insurance; it prevents both loss of stock and of farm income.

There are no obstacles to the conserving of fodder. In good seasons nature provides ample fodder to conserve. Suitable crops can be grown in favourable seasons. The Department of Agriculture, through its field officers and other extension channels, will afford farmers every assistance in the growing and conserving of fodder.

Nor is there any finance obstacle in the way of conserving feed on farms. Through the Rural Bank, the New South Wales Government has made money available for

cash advances to farmers, dairy factories and other rural co-operatives. Low interest is charged on these advances and repayments are spread over extended periods.

The most convincing argument that can be advanced in support of fodder conservation is that it pays. Proof that it does pay is contained in an attractive 8-page folder issued by the Stock Feed Conservation Committee. Copies can be obtained from district officers of the Department or from the Department's Head Office, Box 36A, G.P.O., Sydney.

The alternative to conserving fodder is to gamble with the weather; a gamble in which the dice are loaded against stockowners.

An Active Agricultural Bureau Branch.

Martinsville and District.

THE following facts are gleaned from the annual report of the above branch at a meeting held recently.

The thirty-two members of this branch have had a successful year. These orchardists—dairy, pig, and poultry farmers and market gardeners—have co-operatively bought spray outfits, three or more trucks of dolomite from Queensland, electric motors, petrol engines, spray and dusting material, fertilisers and farm machinery, also twenty-four bags of sugar for fruit fly sprays. Some forty-two subjects in illustrated bulletins, books and leaflets have been distributed by the secretary to members. Contact has been made with the United States of America, South Australia, Queensland and Victorian Departments of Agriculture on subjects such as soil erosion, trace elements, etc.

The monthly meetings have been addressed by departmental officers on poultry, dairying, soil fertility, pasture improvement, etc. The late Professor C. V. Bell interested the members with an address on "Radio Active Storms," and demonstrated with the high-power microscope and radio active metals. Among the many sound films shown at the Bureau meetings were "Artificial Insemination," "Soil Erosion Menace," "Pig Raising," "Poultry," "Harvesting Various Crops," "Spraying," "Ploughing," "Farm Mechanisation," "Marketing," "Calf Rearing," "Forestry," "Insect Pests," and many others.

Several "Field Days" were held—vegetable, dairy and citrus farmers were those catered for; these were attended by departmental officers.

Not only was the Divisional Conference held at the home of this branch, but five of the members were at the State Conference.

The Role of Organic Matter in the Soil.

ORGANIC matter has a triple role to play in the soil. In the first place it acts as a reserve of plant foods. Natural organic manures are usually slow-acting when they are used principally as a source of nitrogen. It is interesting, however, that recently, slowly-acting chemical nitrogenous manures have been developed, which may well play a special part when the opportunities for their use have been more fully tested. As the organic matter originally comes from the soil, so, generally speaking, what has been taken up can be returned in what is likely to be a more readily available form. In the second place it provides energy—food if you like—for the great population of micro-organisms that play their part in converting complex organic residues to the simple chemical substances that make the actual food of plants. And finally it assists in forming the structure of the soil, which is so important in the preparation of the seed-bed and in absorbing moisture and maintaining an air supply in the soil itself. Roots breathe and need oxygen.

The search for a cementing agent in humus to play a part in maintaining soil structure has not been very successful, and we are increasingly inclined to look to grass roots and the structures of the growing fungi to keep the crumbs together that make the ideal structure. Loss of structure means poorer penetration of rain and consequently greater run-off, leading possibly to erosion. It means also frequently the loss of good conditions for seed germination. Structure is most easily destroyed by cultivation and most easily restored by putting the land back to pasture—much more easily this way than by green manuring. At the Waite Institute in South Australia, the greater part of the soil structure built up over the centuries of native conditions was destroyed in four years of cultivation.

The use of humus to build up soil fertility is often advocated these days as being preferable to the use of chemical fertilisers. It will be obvious to you, from what I have said to-day, that plant remains, whether as humus or as ashes, will be more complete than many or any chemical fertiliser. But on any given farm or piece of land there are only one or two, or possibly none, of the plant foods in insufficient amounts to produce satisfactory crops. The use of the proper chemical fertiliser in itself guarantees the proper accumulation of organic matter in the soil, and there is no evidence at all, in a properly constituted crop rotation of cereal and legume or in an equally well constituted pasture, that the use of chemical fertilisers speeds up the decline in humus content; rather to the contrary.—Extract from an address on "Our Increasing Knowledge of Soil Fertility," given by Prof. J. A. Prescott as the 1948 Farrer Oration at the Agricultural Bureau State Conference.

STUBBLE MULCH OR BARE FALLOW FOR WHEAT PRODUCTION.

E. C. POWELL, H.D.A., Agronomist.

WHAT is the role of stubble mulch farming in the wheat areas of New South Wales? Would the adoption of this system of cultivation mean a revolution in wheat-growing methods and in wheat farm economy?

The last revolution in wheat cultivation methods was the general adoption of bare fallowing. Such were the benefits of bare fallow—and indeed such they remain, in yield per acre and immediate security of wheat production—that they must be retained. Fallowing is the bulwark of satisfactory wheat production, and any change in wheat cultural methods must be a modification of the fallowing system.

Stubble mulch cultivation is a method of soil preparation, including seed-bed formation and sowing, which aims at retaining on the surface of the soil, all of the straw from a previous grain crop, to act as a protective mulch.

Will this system of protective fallowing retain the benefits of bare fallowing and eliminate its faults? If not, will it provide other sources of income to compensate for lost wheat production? Further, is it possible that it will retain the benefits of bare fallowing together with added sources of income?

Absence of general use of stubble mulch methods in the New South Wales wheat belt precludes any definite answers to these questions; but ten years' experience in the Central-Western wheat belt, accords the writer grounds to offer some opinions on the subject.

Is a Change in Cultivation Methods Necessary?

Consider first the question, "Is a change in cultural methods desirable, essential or inevitable?" In practically all districts a change is desirable; in most parts of the wheat belt it is essential; and in a considerable part it is inevitable.

Less concentration on crop farming and greater use of pasture and stock are necessary to improve the economics of wheat farming. For this reason change is necessary in most wheat districts. The need of change in the interests of soil fertility and to combat erosion is more restricted in its scope, but is important in a considerable part of the wheat belt.

Maintenance of Soil Fertility.

Supporters of stubble mulch cultivation claim that it will prevent or retard lowering of fertility, which they contend is accentuated by bare fallowing. Some claim that stubble mulch cultivation may be expected to improve the fertility level in many soils, by direct or indirect means.

Soil fertility may be considered from two aspects, viz., chemical fertility, and physical fertility or condition. Chemical fertility concerns the mineral and vegetable plant foods of the soil; physical fertility the soil's texture, structure, and ease of working. Some relationship exists between the two in so far that good physical fertility favours chemical action which converts mineral and plant material to a form suitable for plants. Poor physical fertility need not, however, create a shortage of plant foods; yet it may cause poor crop growth and difficult cultivation conditions itself.

Chemical Fertility.

The record wheat crops of 1947-48 season hardly support the opinion that chemical fertility has been depleted to a serious level by bare fallowing. In any season, if ample moisture is available, there is little evidence to support this opinion, so that a change in cultural methods for this reason alone is yet unwarranted..

It can be assumed that heavy cropping reduces mineral and vegetable plant foods, and that part of the loss would be returned

to the soil by decomposition of stubble mulch straw, but evidence at present is not sufficient to suggest a change to this system for this purpose alone.

Physical Fertility.

Similarly, 1947-48 crops showed that under favourable conditions physical fertility has not been affected sufficiently to prevent good yields being obtained. However, ever increasing run-off of water from cultivation, more surface crusting and shorter periods suitable for cultivation, indicate weakening soil condition, and bare fallowing has contributed greatly to this state of affairs. Excess weathering of the bare surface has caused fining down of the surface soil; unhampered rain drives the soil down quickly and destroys texture, while frequent cultivations with fast-moving implements to keep fallows clean have mechanically destroyed the soil's condition.

Stubble mulching will be less destructive, since by shading the soil, temperature fluctuations will be reduced and excess weathering will be reduced. The straw will impede rain and minimise "driving."

The direct beneficial effect of stubble mulching is more one of reducing the ill-effects of bare fallowing than actually improving the physical fertility of the soil. The indirect effect will be discussed when dealing with pasture establishment..

The Seed-bed.

A firm, even, "sweet" seed-bed is very important in wheat production. Fallowing has been the means of producing ideal seed-beds. This has been generally attributed to cultivation methods, but longer experience has shown that rain, particularly, and sheep are important factors in producing seed-bed compaction; usually a satisfactory bed can be obtained with two cultivations towards the end of the fallow. Stubble mulching might make final seed-bed preparation more difficult, but should not prevent production of suitable beds for maximum wheat production.

Control of Erosion.

One of the chief advantages claimed for stubble mulch cultivation appears to be its effect in controlling erosion, which is encouraged by bare fallowing.

Wind and water erosion are the chief physical reasons requiring a change in farming methods, and the severity of these two items in each locality, together with the economic position of the industry, governs the desirability, essentiality or inevitability of change in cultivation methods as a means to defeat their effects.

There are, broadly, three main soil types: firstly, undulating soils of all classes and colour; secondly, flat, light to medium red to brown and grey loams; and thirdly, flat, medium to strong, intermediate to black coloured soils.

Wind and water erosion on undulating cultivation land is so extensive and is increasing so rapidly, that change in cultural practice is essential and in most cases inevitable, whether the change be to stubble mulch farming or to some other method.

The second class of land mentioned is being considerably affected by wind erosion and change of cultivation methods is desirable, particularly on lighter soils, where it appears to be inevitable.

The heavier flat soils are less affected by wind, and in many cases, a major change in methods will not be necessary, particularly in heavy, black, self-mulching soils.

Wind Erosion.

The fine surface soil encouraged by bare fallowing increases "dust lift" by wind, and the bare surface gives no shelter from direct wind contact. Shelter by surface stubble will reduce loss of soil by wind. In practice the mulch will be less effective than might be expected, since in many seasons when stubble is light or when very windy weather is experienced, the stubble will be blown from the surface to some extent.

Whirlwinds are a serious cause of erosion on fallows. Air temperature increases rapidly on the fine surface of fallows, causing an upward flow of air, which has great earth lifting power. This condition becomes worse in hot summers; loss of dust by whirlwinds tends to "sand" the surface, causing still greater heat. A condition can arise in which whirlwinds become so constant that the ploughed surface can be completely removed from the fallow.

Water Erosion.

The natural consequence of the improved absorption effected by stubble mulching, discussed under physical fertility, and the

direct retarding of water movement by the straw, will be reduction of damage by water erosion on all susceptible soils.

Germination and Young Growth.

The presence of straw or trash prevents the hardening or caking of the surface of the seed-bed. Under these better conditions germination of seed and emergence of the young plants will be facilitated.

Stubble mulch supporters suggest that the growing crop will be favoured by the shelter provided. The most probable benefit to the young crop is that which could result from increased water absorption and moisture retention by the soil.

The Farming Programme.

A problem in stubble mulch farming is the control of weed growth, which can cause the complete loss of the benefits of fallowing. It is not unreasonable to suppose that the suggested favourable conditions for crop growth promoted by stubble mulching will encourage weed growth.

It is contended that weed growth could, and should, be controlled by grazing more sheep, thus reducing the number of fallow cultivations and their undesirable effects.

Stubble mulch farming will raise a number of difficulties in actual cultivation, particularly in the later stages of seed-bed preparation and sowing. Irrespective of the efficiency of adapted equipment, a reduction in the speed of cultivation operations (which is desirable) seems inevitable. The effect of slower working might be offset by longer periods of suitable cultivation conditions, which are at present restricted by lack of water penetration. However, in some cases the increased water absorption and consequent over-wet conditions due to stubble mulch may have the opposite effect and reduce cultivation periods.

In general, it appears that stubble mulching will slow up cultivation, limit wheat acreage to the sowing capacity and, in consequence, possibly lower wheat income and call for other sources of income. It must be appreciated, however, that smaller acreages of wheat might not necessarily reduce the net wheat income.

Reduction of wheat acreage and the opportunity afforded in alternative sources of income might, in fact, be the most significantly favourable features of stubble mulching. Wheat farm economy might be revolutionised accordingly.

Alternative Production.

Increased sheep and lamb production is the logical alternative production on wheat farms.

A feature of stubble mulch farming which has been noted is the suitability of the practice for establishing improved pasture, particularly Wimmera rye grass and Subterranean clover. Preliminary observations indicate that mulch sowing of Subterranean clover is the most promising method yet tried in drier districts and it may

Well-Prepared Bare Fallow.
Showing the ideal degree of cloddiness.

extend the range of this plant in the central-western and western wheat lands. The shelter afforded by straw is essential to the first crucial year of Subterranean clover development in drier districts.

Good Wimmera rye and Subterranean clover pasture, lucerne, and oats are the only profitable means of effectively carrying the increased number of sheep necessary to control summer weed growth. The effect of stubble mulching in successful pasture farming will largely govern the use of the system, since alternative production could be the factor determining the economics of stubble mulch farming in wheat districts, particularly on lighter soils deficient in trefoils. Bare fallowing offers no solution to extension of Subterranean clover, and is detrimental to trefoil development when used frequently.

Pasture farming is a major factor in maintaining soil fertility, particularly physical fertility. Pastures may improve the basic fertility of soils, particularly those of poorer type.

Excluding the use of lucerne, the only means of spelling land in drier wheat areas at present is to leave the land by to regrass naturally. After constant fallowing, the response of natural species is poor and the ley land is more prone to water erosion than cultivation land itself. Means of establishing pastures on land to be spelled in these districts will be a most important contribution to erosion control.

It will be seen, therefore, that stubble mulch may offer means of alternative production. Further, it is possible that it can, by indirect means, have a considerable effect in fertility retention and erosion control.

Farm Implements.

Though many difficulties in application and management will occur in stubble mulch practices and will vary from farm to farm, the chief difficulty will be adaptation of implements for effective work or evolution of implements or attachments to cater for various conditions and demands. This feature is not insurmountable, as indicated by successful application of the system in America and present progress with inventions in New South Wales.

The use of stubble mulch farming will be governed by the proven value of the system. One obvious fault of the system is the increase in fire risk and loss of effective breaks afforded by bare fallows.

Farm Income and Economy.

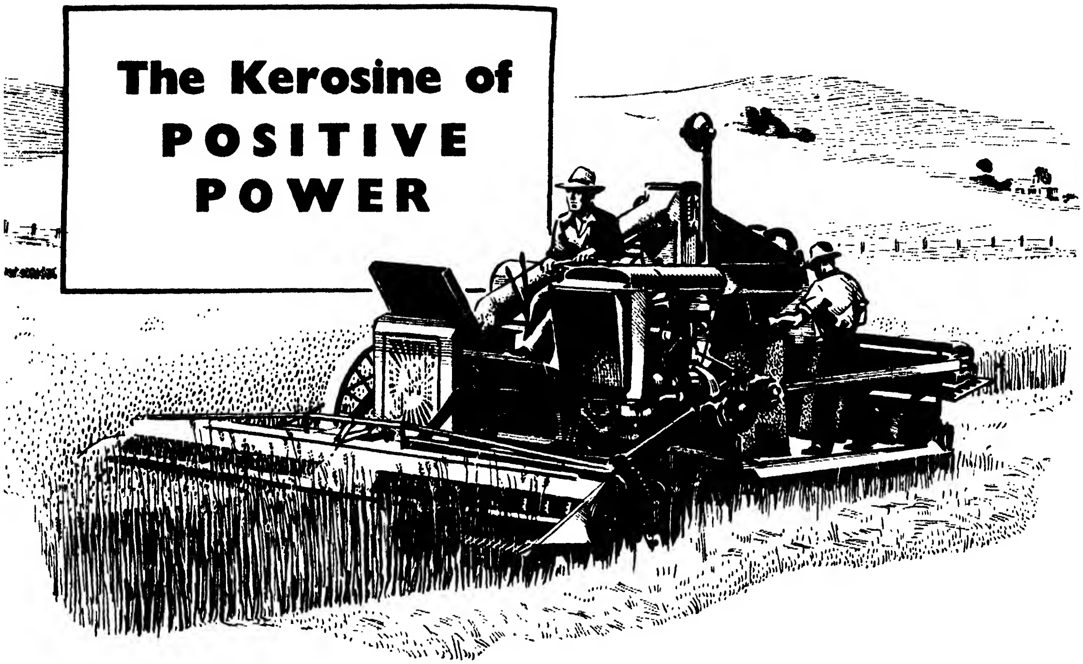
The bare fallowing system of land use, by accentuating erosion, has caused an appreciable loss in the true value of the main farm asset—the land itself. Soil lost means value lost, and continued erosion will, in the long run, mean total loss of the asset. Much of the profit of bare fallowing has been at the expense of capital. It is claimed that stubble mulching will reduce this loss and many reasons are offered to support this view.

Stubble mulch supporters admit that the need of specialised equipment will increase machinery overhead, but the expense of this equipment might not necessarily be great. Indeed, in the long run, it is likely that equipment overhead will be reduced, since the range of implements, by reason of their specialised character, may be less than that necessary for bare fallowing.

Most wheat farms are equipped for the present system of wheat farming, and a reduction in wheat area may mean that the farm will be over-capitalised with plant. It is suggested by stubble mulch supporters that one of the chief advantages of the system from the aspect of farm economy and erosion control will be more pasture farming; in fact this might be the feature determining its use on wheat farms. To farm pastures properly requires much work, such as topdressing, renovation, etc., and the wheat machinery would be used to some extent for this work. However, stubble mulch farming may mean some over-capitalisation with plant, at least temporarily, on some farms.

It is suggested that stubble mulch farming will directly reduce production cost, due to less frequent cultivation of the fallow, a factor further affected by lower wear and tear and lighter machinery repair bills. One definite feature at present lowering cost of production is elimination of ill-shaped working "lands" by control of water erosion and consequent gullies.

Wheat acreage may or may not be reduced by stubble mulching, with a probability of the former condition arising. If wheat acreages are reduced, wheat income might be reduced also; however, it is equally



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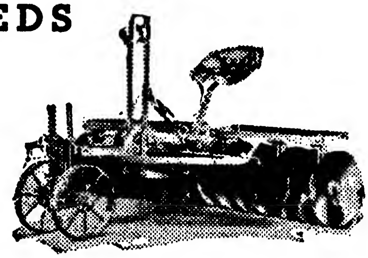
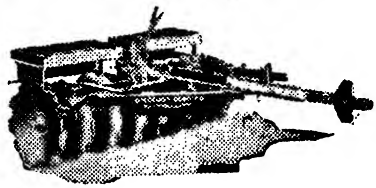


GL-17 Bumper Disc Harrow. Can be supplied with tractor hitch. Tandem attachment also available. Sizes 5, 6 and 7-ft.



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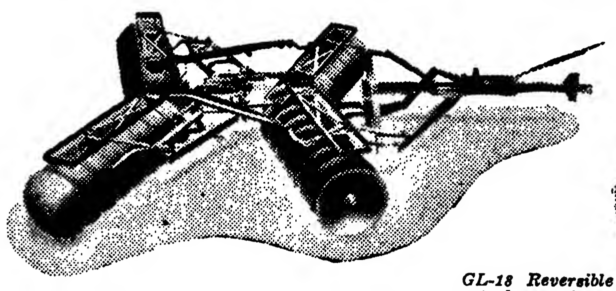

GL-9A Tractor Tandem Disc Harrow. Made in 5, 6, 7, 8 and 10-ft. sizes.

GL-18 Reversible Disc Harrow. High frame attachment for tall row-crops can be supplied. Size 4-ft., with 18 or 20-inch crimped-centre discs.

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probable that the net wheat income could be maintained at a level equal to that from larger areas, by reduction of numerous costs small or large, which could attend a smaller area of crop, and by increase in yield per acre. Yield per acre could be increased on smaller areas without stubble mulching, due to operations being carried out under the best conditions, and stubble mulching may afford a greater spread of "best conditions." Further, the better soil condition encouraged by stubble mulching could improve yields per acre considerably. Better retention of water could also be a crucial factor in increasing the yield.

A Riverina Crop Grown on Bare Fallow.
Yield 45 bushels per acre.

Stubble mulch farming with an accompanying increase in pastures on wheat farms could provide an increase in alternative income to offset any possible loss in wheat income, and it is not beyond possibility that the alternative income might be additional to a well maintained profit from wheat.

Should stubble mulch farming be the means of extending pasture farming and more intense mixed farming in wheat districts, it will certainly be the means of spreading the source of income of wheat farmers thus rendering wheat farm economy more secure and stable.

Conclusion.

Stubble mulch farming is still largely a theory, so far as general application in Australia is concerned. Bare fallowing is a proven practice yielding benefits which are the foundation of successful wheat production, yet having some serious faults.

It will be seen that stubble mulching may still provide the essential benefits of bare fallowing and eliminate its faults, and accordingly warrants a trial by all interested in wheatgrowing.

It should be kept in mind that all practices emanate from theories, whether those of farmers themselves or those of scientists, and it is the application of theories which eventually provides practical solutions to all problems.


DON'T GAMBLE WITH THE WEATHER
THE DICE ARE LOADED AGAINST YOU
CONSERVE FODDER
DETAILS OF ASSISTANCE from DEPARTMENT OF AGRICULTURE, SYDNEY
CONSERVATION COMMITTEE
Authorised by the Hon. E. H. Graham, M.L.A. Minister for Agriculture

A Summary of the Damaged Caused by—

STEM RUST OF WHEAT.

VALUE OF RESISTANT VARIETIES.

F. C. BUTLER, B.Sc.Agr., Assistant Plant Pathologist.

DESPITE its spasmodic occurrence, stem rust of wheat, caused by the parasitic fungus *Puccinia graminis tritici*, has long been regarded as one of the most serious diseases with which the wheat-grower has to contend. Ever since wheat was first grown in this State, stem rust has caused heavy losses in seasons which favoured its development.

In the 1947-48 season when an unprecedented loss of more than 10,000,000 bushels was experienced, a comprehensive rust damage survey was carried out. This not only showed the extent of the damage in the various sections of the wheat belt but emphasised the value of the rust-resistant varieties that have been released for commercial production in recent years.

The total damage would have been much greater had not slightly more than 50 per cent. of the area in the northern portion of the wheat belt (where damage to susceptible crops was heaviest) been sown to these rust-resistant wheats. These varieties are recommended for and yield well under a wide range of conditions. It is anticipated that in future they will be grown increasingly throughout the wheat districts.

In the absence of resistant varieties, stem rust manifested itself as a serious menace to wheat production in this State from the earliest days of colonisation, and the losses it caused during the nineteenth century were largely responsible for the westward movement of the wheatgrowing industry from the rust-favourable climate of the coastal areas to the drier inland areas. However, though the westward extension of wheat-growing into the less rust favourable climate of the inland brought some relief, the disease continued to cause severe losses in particular years.

The rust epidemic season of 1889-90, for example, caused a total Australian loss of approximately £2,500,000. By far the greater proportion of this amount was lost in New South Wales. Experiences such as this emphasised the economic importance of stem rust and led to the convening of a number of Interstate Rust in Wheat Conferences, at which delegates considered the problem of rust control.

The need for rust-resistant varieties, of which none were available up to this time, was pointed out by William Farrer at the Sydney Conference of 1891. At this conference Farrer reported that " . . . after having for many years given much thought to the rust pest as it affects the wheat plant in this country, I have been led to the conclusion that the best manner of combating the pest appears to be to give special attention to the securing and creating of resistant varieties . . . "

At the same time Farrer stressed the necessity for improving the drought resistance and flour quality of Australian wheats. In all his subsequent crossbreeding and selection work, particularly after becoming Wheat Experimentalist, Department of Agriculture, New South Wales, in 1898, Farrer constantly aimed at three major objectives—rust resistance, drought resistance and improved quality. Whilst he achieved considerable success in his efforts to produce high quality and drought-resistant varieties, Farrer was not so successful in his attempts to evolve rust-resistant wheats. Indeed of the many varieties, amounting to over 220, which he did breed or select only one—Warren—possessed any appreciable degree of rust resistance, although a number such as Clarendon, Florence and Thew, being early-maturing, were

able to escape rust to some extent and were therefore an improvement on then existing varieties.

Damage in "Rust" Years.

From Farrer's day until the mid 1930's very little progress was made in the evolution of rust-resistant varieties, and during this period few varieties which achieved a degree of prominence possessed any worth-while resistance. As a result, stem rust continued to exact a heavy toll throughout the State, in seasons which favoured its development. A summary of the estimated losses in the six most severe "rust" years, experienced during this period, is given in the following table:—

Season.	Estimated Loss.	Approximate Value Loss.*
	bushels	£
1903-04	3,000,000	475,000
1916-17	8,300,000	2,000,000
1920-21	1,600,000	686,000**
1925-26	3,000,000	925,000
1930-31	2,000,000	383,000
1934-35	3,000,000	468,750

*On home consumption price basis.

**Losses in North West only—figures for Central and Southern districts not available.

In the seasons referred to in the table, losses were experienced on a virtually State-wide basis. Substantial losses also occurred in particular areas of the State on several other occasions during the same period, and it has been estimated that the average annual loss due to stem rust during the 20-year period, ending 1935-36, amounted to over a quarter of a million pounds.

Such severe losses as those recorded, even though spasmodic in their occurrence, serve to emphasise the economic importance of stem rust as a disease of wheat in this State.

Unprecedented Damage in 1947-48.

Further evidence of the capacity of rust to reduce yields substantially was provided by the unprecedented bushel losses which occurred as the result of a severe epidemic last season. Weather conditions during spring and summer were extremely favourable for the development of the disease, particularly in the north-west and central-west, where the heaviest losses were recorded. Fortunately, rust developed too late in the season to cause general damage in the southern portion of the wheat belt, although some areas were seriously affected.

Results of Comprehensive Survey.

As a result of a comprehensive survey of rust damage, conducted in co-operation with Departmental agronomists stationed in the wheat belt, it has been possible to arrive at an accurate assessment of the yield losses experienced last season.

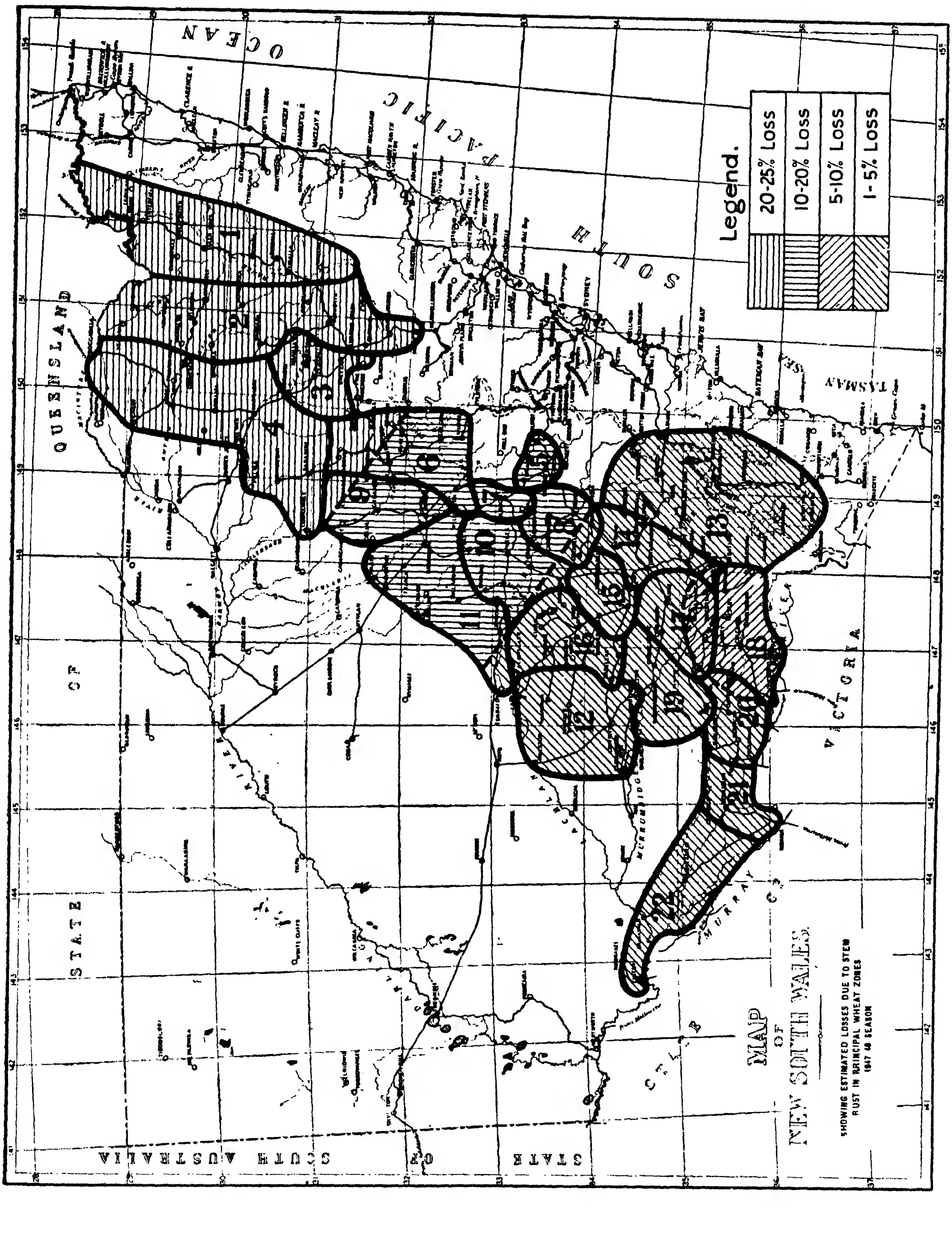
The following table shows the estimated reduction in yield on both a percentage and bushelage basis in all the major wheat-growing areas of the State.

District.	Embracing all or portion of wheat zones nos.*	Estimated percentage loss in yield due to stem rust.	Estimated Reduction—bushel yield due to stem rust.
	zones nos.	per cent.	bushels.
Albury ...	17, 18, 20	5	223,000
Armidale ...	1, 2	20	6,000
Berrigan ...	20, 21, 22	1·8	57,000
Dubbo ...	4, 6, 9, 11	20	2,741,000
Griffith ...	12	3	76,000
Gunnedah ...	2, 3, 4	25	1,440,000
Inverell ...	2, 4	20	516,000
Leeton ...	12, 16, 19	1	52,000
Mudgee ...	6, 9	15	787,000
Orange ...	5, 7, 8	20	1,013,000
Parkes ...	10, 11	10	1,740,000
Tamworth ...	1, 2, 3	25	140,000
Wagga ...	13, 14, 15, 16, 17, 19.	8	953,000
W. Wyalong	11, 12, 15, 16	1	98,000
Young ...	8, 10, 14, 16	2·5	310,000
			10,152,000

*See map on page 513.

On the basis of expected yields prior to and after the appearance of stem rust, this loss represents an over-all reduction of approximately 9 per cent. in the State's wheat yield. On occasions, a higher average percentage loss on a State-wide basis has been experienced, but the total loss in any one season has never before exceeded 10,000,000 bushels. This apparent anomaly is explained both by the increased acreage under wheat last season and the record average yield for the State—19.8 bushels per acre.

Reference to the accompanying map (page 513) will show that the wheat belt has been divided into four main regions according to the severity of rust losses. It will be noted that the greatest percentage reductions in yield occurred in northern and central-western districts. Losses in the southern portion of the wheat belt were, for the most part, below 5 per cent., although south of Wagga, some losses of up to 10 per cent. were experienced.


Legend.
20-25% Loss
10-20% Loss
5-10% Loss
1-5% Loss
MAP OF NEW SOUTH WALES
SHOWING ESTIMATED LOSSES DUE TO STEM RUST IN PRINCIPAL WHEAT ZONES 1947-48 SEASON
QUEENSLAND
STATE OF SOUTH AUSTRALIA
VICTORIA
SOUTH PACIFIC OCEAN
TASMAN SEA

Influence of Resistant Varieties.

The losses, serious as they were, would have been even greater had it not been for the rust-resistant varieties, Celebration, Charter, Gabo, Kendee and Yalta. Products of years of research and selection, these five varieties serve to illustrate the outstanding progress which has been made in the evolution of rust-resistant wheats in this State during the last decade.

Although bred initially for distribution in the north-west, all with the possible exception of Charter, have subsequently shown a wide adaptability range. In an endeavour to determine the extent of their present distribution, an assessment was made of the acreage devoted to these varieties in the various wheat districts of the State last season. This assessment was made in conjunction with the stem rust damage survey, and revealed that they occupied a total of over 500,000 acres, representing approximately 10 per cent. of the State's wheat acreage for grain purposes.

There was, however, a very unequal distribution of this acreage throughout the State. No less than 400,000 acres of the 513,700 acres sown to these varieties were confined to the northern portion of the wheat belt, where they accounted for slightly more than 50 per cent. of the total acreage sown. Elsewhere in the State, the remaining 108,700 acres constituted less than 2.5 per cent. of the wheat acreage.

The following table shows the total acreage sown for grain in the major wheat-growing districts of the State, together with the estimated acreage devoted to rust-resistant varieties.

District.	Approximate total area sown to wheat for grain.	Approximate area sown to rust resistant varieties.
	acres.	acres.
Albury	300,000	3,000
Armidale... ...	2,000	500
Berrigan ...	190,000	5,025
Dubbo	656,000	3,280
Griffith	150,400	1,504
Gunnedah ...	480,000	240,000
Inverell	245,520	159,488
Leeton	230,000	4,600
Mudgee	260,610	32,576
Orange	169,930	1,100
Parkes	832,400	41,620
Tamworth ...	25,000	5,000
Wagga	601,590	6,016
West Wyalong ...	550,000	5,500
Young	447,455	4,474
	5,140,905	513,683

Quite apart from their outstanding rust resistance, all five varieties have proved their ability to yield well under varying conditions and are now recommended over a wide area of the wheat belt.

Their value in the north-west, where they already comprise approximately 50 per cent. of the acreage, was strikingly demonstrated last season and it is almost certain that they will in future be sown on an increased scale in this portion of the State. Though not yet grown to a large extent in central-western and southern wheat districts, they have performed well and it is confidently expected that they will continue to gain favour in these areas also.

Zones for which Resistant Varieties are Recommended.

Farmers who have not yet given any of these rust-resistant varieties a trial are strongly advised to do so. The following table lists the wheat zones (see map) for which each is recommended, and should assist the intending grower in his selection of varieties. Particular attention should be given to the time of planting, especially with such early-maturing varieties as Charter and Gabo, which if sown too early are liable to frost injury.

Variety.	Recommended for—
Celebration ...	Early sowing: Zones 2, 3, 4, 6, 7, 8, 9, 10, 14, 15, 18, 23. Midseason sowing: Zones 1, 5, 13.
Charter ...	Midseason sowing: Zone 4. Late sowing: Zones 2, 3, 4, 5, 6, 9.
Gabo	Midseason sowing: Zones 11, 12, 21, 22. Late sowing: Zones 2, 3, 4, 6, 9, 10, 14, 15, 16, 17, 18, 19, 20, 23.
Kendee ...	Early sowing: Zones 11, 12. Midseason sowing: Zones 2, 3, 4, 6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 23.
Yalta	Early sowing: Zones 11, 12. Midseason sowing: Zones 2, 3, 4, 6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 23. Late sowing: Zone 1.

N.B.—Zone 23=Murrumbidgee Irrigation Area.

In addition, Celebration is recommended for early sowing in coastal districts, whilst Charter and Gabo are recommended as early-maturing varieties for hay or green fodder.

The late-maturing variety, Fedweb 1, is also highly resistant to stem rust and is recommended for early sowing in Zones 2, 3 and 4.

(Continued on page 520.)

THE BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics.

THE EXCHANGE RATE AND THE RURAL COMMUNITY.

ON the 19th August, 1948, the New Zealand Government announced that the New Zealand £1 would have parity with the English £1. Formerly £1 sterling was worth £1 5s. 0d. in New Zealand. As a result of this sudden change there was considerable speculation in the Daily Press as to whether Australia would follow New Zealand's example. Although it does not seem likely that the Federal Government will follow suit in the near future, this article discusses the importance of the exchange rate and its relation to rural incomes.

In the first place it should be pointed out that Australia is a member of the International Monetary Fund—whilst New Zealand is not. Membership of this Fund imposes the obligation on the Australian Government to obtain approval from the Fund of any revaluation of currency of more than 10 per cent. (to bring the Australian pound to parity would involve a 20 per cent. revaluation). Assuming that, either with or without I.M.F. approval, Australia revalued her currency at parity with sterling, what effect would such a move have?

At the present time an overseas buyer of £A125 worth of Australian wheat or wool pays £100 sterling or its equivalent in francs, rupees, etc. If Australia brought its pound to parity with sterling the immediate effect would be that Australian wheat, wool, etc., would become 20 per cent. more expensive in terms of sterling or other foreign currency. In other words, the same £A125 worth of Australian exports would then cost £125 sterling or their equivalent, for the British, French, or Indian importer, whether he be a private person or the government of the country concerned.

Such a rise in price would normally lead to a decline in the quantity of goods other countries would want to buy from Australia for two reasons:

1. They would turn for their supply of primary products to our competitors—such as Argentina, Canada, U.S.A. etc., whose prices would not have increased.

2. Where Australia produces a substantial portion of the total supply of one particular commodity, such as, for instance, Merino wool, other countries would not be able to switch their purchases to other suppliers. But the increased price in terms of their own currency, would act as a deterrent, so that they would use less wool and maybe more synthetic fibres.

Both these forces would operate in normal times to reduce the prices of those rural products which we export. However, at the present time three factors operate which would soften any such tendency of export prices to decline as a result of revaluation of the Australian pound.

In the first place a large proportion of our exports has been sold under long term contracts to the British Government (e.g.,

butter, eggs, etc.), and the prices Australia will receive have been fixed in local currency; so that the British Government would be forced to pay higher prices if Australia appreciated her currency, but the return to Australia in terms of Australian currency will remain fixed for the duration of the respective contracts. Secondly, there are some commodities for which a world price does not exist at present, e.g., wheat, and in many cases Australia's exports of such commodities (e.g., wheat and butter) are sold to Great Britain at prices below those charged by other countries (e.g., Argentina, Denmark). Thirdly, Australian exports are, at the moment, in great demand, i.e., we are facing a seller's market, and it is possible that other countries would be willing to pay even higher prices for our products than they have in the immediate past.

However, there can be little doubt that any action to bring the Australian pound back to parity will reduce prices which local farmers and graziers receive on the export market. In the case of those commodities where long term contracts exist, or where products are sold at lower prices than those charged by our competitors, this decline may not make itself felt for some time.

Revaluation should not, however, be condemned out of hand by the rural community because it will tend to reduce export prices and thus farm income. There are several other effects which have to be considered. Revaluation would reduce prices of all our imports by 25 per cent. This would lead to a proportionate reduction in the retail price of cars, petrol, imported machinery, textiles, etc. The rural community would gain to a certain extent by these lower prices, which would help to counteract the inflationary tendencies which are such a marked feature of our economy at the moment. Conceivably also, since interest charges on overseas loans would be decreased by 20 per cent., the savings so made might be reflected in taxation reductions.

From a long term point of view, our competitive position relative to other countries would be strengthened because land values in Australia would not increase as much as they would if the Australian pound was not brought back to parity. Hence, costs of production of primary products would be likely to remain at a lower level.

It can be seen, therefore, that this issue cannot be judged solely from the point of view of its short-term effects on rural incomes, but that several other factors enter which may be of equal importance to the rural community. Ultimately the question of the advisability of altering our exchange rate must, of course, be decided on the effects it may be expected to have on the Australian economy as a whole.—F. H. GRUEN, Economics Research Officer.

JUTE BAGS SUPPLY PROBLEMS.

AUSTRALIAN primary producers have experienced great difficulty in recent years in securing adequate supplies of bags to be used in the transportation of their products. However, the problem has not been merely a local one, because bag shortages are world-wide. Almost all agricultural and other commodities are bagged at some stage of their production, and are put in bags made of jute which is one of the chief fibres in world trade. The bulk of the world jute crop is grown in India, which ordinarily produces sufficient quantities to meet world demand. However, Indian output has been restricted since 1941, and in 1946 it was further curtailed in order to transfer jute areas to much needed food crops. As a result the fibre is currently in short supply.

The following table shows the relative importance of India in the world production of jute.

Commercial production of jute outside India has been confined to Formosa, Indo-China, Iran and Japan.

In addition to being the world centre of jute production, India is also by far the most important jute manufacturing area, and commercially accounts for more than half world consumption of raw jute. Jute occupies an important position in India's

export trade. The export of raw jute and jute manufactures from India has been subject to control since the outbreak of World War II.

Jute Fibre: Relative Importance of India in World Production.

Period	World Production	India's share in World Production
	(1,000 Metric Tons)	(Per cent.)
1934/35–1938/39 (average)	1,510	99
1939/40–1943/44 (average)	1,635	99
1944/45	1,150	98
1945/46	1,475	98
1946/7	1,035	97

The outlook in jute and jute manufactures has become more uncertain as a result of the partition of India into the new Dominions of India and Pakistan. Raw jute resources are now concentrated in the Dominion of Pakistan. Eastern Pakistan, which was constituted largely from northern and eastern Bengal, now includes within these borders the principal jute-growing regions of the world. Western Bengal, including Calcutta, which is the world centre of jute manufacturing and export, is a part of the Indian Union. This concentration of raw jute resources in the Dominion of Pakistan is evidenced in official crop estimates which show that more than three quarters of the total area planted to jute in 1947 is located in Eastern Pakistan and that four-fifths of the total production is expected to come from this region.

In contrast to this distribution of raw jute resources, the jute mill industry and most of the hydraulic presses used in baling jute fibre for export are located in the Dominion of India, mostly around Calcutta. Most of the crop comes into the Calcutta markets, and only a small proportion is consumed in the local villages. Owing to the drastic restriction of jute acreage in Bengal in 1946 the Indian jute crop for 1946-47 was only just over half pre-war average. Although the 1947-48 crop was expected to be about one and one half times that of 1946-47, receivals in Calcutta have been much smaller than expected, due mainly to the apparent over-taxing of rail and transport facilities in the transfer of population and property between the new Dominions.

Trade in jute has suffered a further setback as a result of the difference between India and Pakistan on the sharing of jute export "revenues." Before the partitioning, export taxes on jute fibre were collected at the port of exit, usually Calcutta, and two-thirds of the revenue was distributed among the jute-growing provinces. Since partitioning India and Pakistan have disagreed over the sharing of taxes on jute exports which have continued to move through Calcutta.

In November, 1947, Pakistan instituted its own tax on jute, which was levied on jute fibre moving across Pakistan's land frontiers. Following the successful conclusion by India and Pakistan of far-reaching economic agreements last December, it seemed that the jute tax problem might be solved. However, in late December the Government of India decided to retaliate, after Pakistan's imposition of an export tax, and decided to treat Pakistan as foreign territory for the purpose of levying customs duty on the export of raw jute and jute manufactures from India to Pakistan. In a notification dated 27th February, 1948, the Government of India indicated that its decision would take effect from 10th March, 1948.

Further difficulties have occurred in the division between India and Pakistan of foreign exchange receipts from trade in jute, particularly dollars from the United States.

In view of the urgent need for agricultural bagging it is hoped that an early agreement can be reached between the two Dominions on these problems of jute production and distribution, seeing that the jute economy of each Dominion is so completely dependent on that of its neighbour. Production costs of Australian products for which bags are used will be materially affected by the outcome of negotiations on these seemingly remote disarrangements in trade.—J. B. MAYNE, Economics Research Officer.

PREPARING A FARM BUDGET.

LAST month the subject of farm budgeting was discussed and some of the ways in which a farmer might gain considerable financial advantage by regularly preparing a budget were set out. This month it is intended outlining the steps which should be taken in the actual preparation of the budget.

The process of farm budgeting is divided into two distinct stages, viz., the physical budget and, second, the financial budget. It is, of course, the financial budget in which the farmer is ultimately interested. However, it is impossible to prepare a financial budget without first preparing a physical budget.

STEPS IN PREPARING A FARM BUDGET.

The Physical Budget.

The First Step.

It is necessary to draw up a tentative production plan for the farm, indicating the number of acres of each crop which are to be raised, and the number of head of each kind of livestock which are to be kept. The number of livestock chosen is determined by the known carrying capacity of the farm and a general idea of the amount of the supplementary feed which will be available.

This is known as a crop and livestock production programme. Where alternative plans are being considered several alternative crop and livestock production programmes will have to be drawn up for a period in advance. This period is usually a year and it is desirable, so far as is possible, that the budget should be prepared before the actual production programme is put under way. With crops, plans for the next season are usually made just after the previous crop has been harvested, and January, therefore, is probably the best month in which to prepare a budget on wheat farms, although, of course, in some areas tentative plans must be made much earlier if fallowing is practised. So far as livestock are concerned, the length of the gestation period affects the time at which plans should be made and, in mixed farming, the time of the year in which it is desirable to prepare a budget must be determined by the particular circumstances in the district concerned.

The Second Step.

The total production of each crop and each kind of livestock should be estimated, assuming normal yields.

The Third Step.

The amount of each of these products which will remain for sale after various amounts have been allocated for farm use and for household use should be calculated.

The Financial Budget.

The Fourth Step.

An estimate is made of the prices which are likely to be obtained for the various products when sold, and from these a calculation of cash receipts is made. To the sum of these receipts, any income likely to be obtained for work done off the farm is added to give an estimate of total returns.

The Final Step.

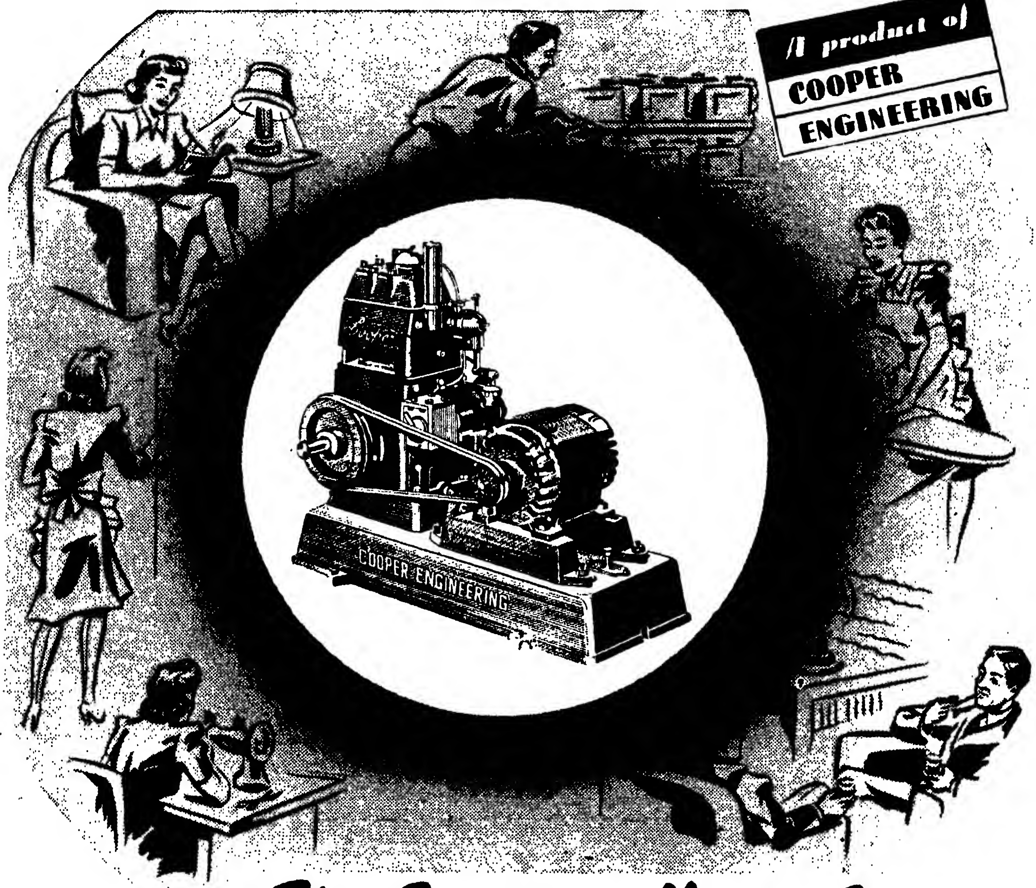
Finally, it is necessary to make a series of estimates of the expenses (both direct and general farm expenses) likely to be incurred in following out the programme outlined. The total of these costs is subtracted from the total receipts to give an estimate of the probable net return.

Cash Costs and Receipts Only.

It should be noted that, in budgeting, generally only cash expenses and cash receipts are taken into consideration. What are termed "overhead expenses"—and these include such items as depreciation, interest and insurance, family labour and various other items which do not fluctuate to any extent from year to year, and which also would not fluctuate very greatly irrespective of the crop and livestock programme carried on—are not taken into account. Although such overhead expenses often comprise a large proportion of total expenses, there is no necessity to take them into account in budgeting unless a major change in the farming system or the purchase or renting of additional land is contemplated.

Sources of Information.

Any budget is only as accurate as the information on which it is built, and it is, therefore, most important to obtain the most reliable information available on which to base estimates of yields,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A TYPICAL FARM BUDGET.*

This table illustrates the way in which a budget may be drawn up for a small mixed farm.

Crops	Acres	Unit	Expected Production: Per acre	Expected Production: Total	Amount to be used for: Feed	Seed	Re-serve	House hold	Farm Receipts: Amt for sale	Price	Value
											£
Oats for grazing ...	12	ton	¾	9	9						
Oats for hay ...	30	ton	1½	45	10		10		25	£7	175
Potatoes	10	cwt	80	800	30	15		10	735	16s.	588
Millet for grazing	4										
Temporary pasture	8										
Improved pasture	100										
Natural pasture ...	220										
Livestock and Livestock Products.	**Head**	**Unit**	**Expected Production: Per head**	**Total**	**Estimated Deaths**		**Amount used in Household**				
Horses	6										
Dairy Cows ...	12										
Milk ...		gal		450			450				
Butter ...		lb	300	3600			320		3280	1/11	314
Calves ...				12							
Cull cows ...	3								3	£15	45
Steers ...	5						1		4	£18	72
Other dairy stock ...	4										
Sheep	500				10		40		50	£3	150
Wool ...		lb	10	5000					5000	50d.	1042
Lambs ...				340					340	£2	680
Skins ...											10
Pigs	3										
Baconers ...				22			2		20	£7½	150
Other farm income											
									Total receipts		£ 3226

Farm Expenses: Item	Value
	£
Crop expenses:	
Seed	49
Fertiliser	148
Other supplies ...	107
Livestock expenses:	
Purchase of feed ...	184
Shearing	34
Veterinary expenses ...	14
Other expenses ...	52
General expenses:	
Hired labour	640
Petrol, oil, etc. ...	37
Machinery repairs ...	64
Building and fence repairs	41
Rates	18
Insurance	29
Livestock purchases ...	187
Marketing expenses ...	99
Other general expenses	35
Total expenses ...	1738
Total receipts ...	3226
Total expenses ...	1738
Net income	£ 1488

*The figures used in this table are for purposes of illustration only and under no circumstances should they to be assumed to be forecasts of probable future prices.

cost and probable prices in the future. Information regarding yields and costs can best be obtained by the farmer himself from his own records, kept over a period of years. Where such records are not available, particular care should be taken to ensure that yields are not over-estimated or that costs are not written down to an unduly low figure.

The question of future prices is a far more difficult one, and for information regarding prices, farmers must rely to a large extent on official information published by State Departments of Agriculture and by Commonwealth instrumentalities such as the Commonwealth Bureau of Agricultural Economics, which will, in the near future, be publishing regular market outlook statements with a view to providing farmers with the latest information regarding production and market prospects for all major primary products.

A Typical Farm Budget.

The table accompanying this article illustrates a typical farm budget for a small mixed farm. A careful study of this sample budget should enable the farmer to draw up a budget for his own business irrespective of his type of farming.

Spray Grape Vines Now.

As an Insurance Against Downy Mildew.

LAST season was a particularly bad one in New South Wales for downy mildew disease of grape vines. Some growers were caught napping and others gambled on the weather conditions—and lost. Steps should be taken now to ensure that last year's heavy losses are not repeated this season.

Prior to last year we had a fairly long run of seasons free from this disease and there was, therefore, unfortunately, an inclination on the part of some growers to take risks. From a business point alone, this was bad policy as grape prices—particularly those for wine grapes—have been high.

Loss of crop through neglect of spraying means a serious monetary loss and vine growers would be well advised to apply Bordeaux spray early this season, even though the weather may appear to be dry. Even if downy mildew does not make an appearance, it is considered foolish and bad business practice to take the risk of being unprepared.

Not only is there a risk of losing a crop or part of a crop, but downy mildew attacks also interfere with the proper ripening of the grapes and consequently the quality of wine made from grapes—as well as seriously affecting the ripening of the vine wood which can mean the loss of crop the following year.

I have seen one vineyard where spraying was neglected last season in which the vines will die from downy mildew attack. In another instance the crop was a complete loss with the wood very badly affected; very little good wood could be found on the vines at pruning time. Some vines may die and it is definite that little crop will be picked in the 1949 season.

Growers must realise that, should weather conditions this season prove favourable for downy mildew development, the disease will be very active early, as the over-wintering spores will be numerous after last year's outbreak.

Early spraying gives the vines some protection, since the inside foliage and growth is covered with spray. Later, as the growth becomes thicker and heavier, it is difficult to cover the inside growth satisfactorily.

Start spraying early, and follow up as the growth increases, is sound advice. If the summer proves wet, spray frequently and the strength of the Bordeaux mixture can be increased. If spray material is not already on hand, order it now and also have the machines in good order so that the work can be undertaken at a moment's notice.—H. L. MANUEL, Viticultural Expert.

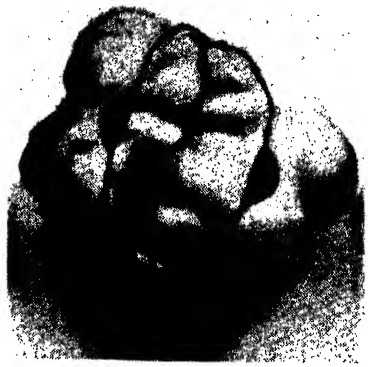
Stem Rust of Wheat—*continued from page* 514.

Acknowledgements.

Grateful acknowledgement is made of the co-operation and assistance given by the following District Agronomists in the assessment of stem rust losses during the 1947-48 wheat season:—Messrs. F. Autry Hall, J. G. Ballantyne, G. C. Barlett, E. W. Bowmaker, J. W. Boyle, H. A. Grantham, L. W. McLennan, R. C. Madsen, F. C. Morris, J. A. O'Reilly, T. S. Rudkin, R. W. Shelley, W. R. Watkins, H. A. W. Woodward and F. York.

"Catface" Tomatoes Should Not Be Marketed.

MANY complaints have been received in the markets in recent years of the practice of marketing what are known as "catface" tomatoes.



These fruits are malformed by having a depression in the blossom end of the tomato resembling the mouth portion of a cat's face, often with one or more projections showing from within.

Generally this type of fruit is divided into segments, and ripening of the individual portions occurs at different times. Tomatoes are often found in the Markets with one of these segments breaking down, while the balance are only partly coloured. Seldom does even ripening of such fruit occur. As a consequence consumers suffer considerable loss by having to cut off and waste portions of the fruits—and consignments containing such fruits are avoided or bring reduced prices.

The "catface" condition is caused by faulty fertilisation of the tomato flower, and is most common in cold seasons when poor conditions for pollination prevail, and in the Chinese varieties—particularly Rouge de Marmande. It is therefore likely to be prevalent this season.

It is in growers' own interests that they refrain from including "catface" tomatoes in their good lines.—L. T. BILBE, Senior Inspector of Markets.

Departmental Appointments.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) has announced the appointments of Mr. S. C. Hodgson, H.D.A., Manager of Wagga Experiment Farm, to the position of Assistant Manager of the Government Grain Elevators; and Mr. B. Doman, B.Sc.Agr., H.D.A., at present Lecturer in Agriculture at Hawkesbury Agricultural College, as Manager of Wagga Experiment Farm.

Mr. Hodgson, who gained his H.D.A. with Honours in 1925, joined the Department in 1927 and served in many districts. He joined the second A.I.F. in 1942 but was withdrawn for special duties with the Commonwealth Controller of Defence Foodstuffs until 1945. From then until 1947 he served as First Assistant to the Commonwealth Director-General of Agriculture, and then returned to this Department to manage Wagga Experiment Farm.

"Like Mr. Hodgson, Mr. Doman also has had a very wide and successful career in the Department of Agriculture," said Mr. Graham. After graduating at Sydney University, Mr. Doman was stationed at Cowra and Temora Experiment Farms before being posted to Hawkesbury Agricultural College. From 1942 to 1946, he served in the second A.I.F. Mr. Graham said that Mr. Doman had both the types of broad agricultural experience essential to enable him to assume the responsibility of managing Wagga Experiment Farm which, at the present time, was catering for the training of students for agricultural careers.

ALTHOUGH there is always some risk of an uneven stand by planting cut potato seed, because of rotting of the seed piece, the risk is not very great when planting is carried out in a well-prepared moist soil during the cooler months; thus cut seed may be safely used for the early crop. It is important, however, that the seed sets should not be too small.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Albury	October 12, 13, 14
Kyogle	October 13, 14
Cootamundra (D. H. Boyd)	October 15, 16
Lismore National	October 19, 20, 21
Holbrook (Thelma Stewart)	October, 22, 23
Alstonville	October 27, 28
Murwillumbah	November 3, 4
Mullumbimby	November 10, 11
Bangalow	November 17, 18
Nimbin	November 24, 25

1949.

Albion Park	January 14, 15
Dapto	January 21, 22
Lithgow	February 4, 5
Liverpool	February 5, 6
Luddenham	February 11, 12
Paterson	February 11, 12
Dorrigo (H. S. Doust)	February 16, 17
Tenterfield	February 17, 18, 19
Gunning	February 18, 19
Wyong (F. Akhurst)	February 18, 19
Newcastle (P. Legoe)	February 23 to 26
Guyra	February 25, 26
St. Ives	February 25, 26
Yass	February 25, 26
Coonabarabran (M. J. Hennessy)	March 1, 2
Walcha	March 1, 2
West Maitland (R. E. Holroyde)	March 2-5
Glen Innes	March 3, 4, 5
Comboyne (W. R. Cooke)	March 4, 5
Penrith	March 4, 5
Queanbeyan	March 4, 5
Uralla	March 4, 5
Tumbarumba (Mrs. U. M. O'Shea)	March 8, 9
Braidwood	March 11, 12
Blacktown	March 11, 12
Burrowa	March 11, 12
Cessnock	March 11, 12
Inverell	March 11, 12
Armidale	March 17, 18, 19
Crookwell	March 17, 18, 19
Barraba	March 18, 19
Gloucester (Mrs. M. A. Newton)	March 18, 19
Gresford	March 18, 19
Parramatta	March 18, 19
Warialda	March 22, 23
Taralga	March 24, 25
A.C.T.	March 25, 26
Bingara	March 25, 26
Castle Hill	March 25, 26
Dungog	March 25, 26
Manilla	March 25, 26
Muswellbrook	March 29, 30
Tamworth	March 29, 30, 31
Camden (G. V. Sidman)	March 31, April 1, 2
Goulburn	March 31, April 1, 2
Quirindi	April 1, 2
Sydney Royal	April 9 to 19
Gunnedah	April 26, 27, 28
Boggabri	April 29, 30
Horsley (J. A. Siggers)	April 30
Narrabri	May 5, 6
Hawkesbury District (Clarendon), T. J. Cambridge	May 5, 6, 7

Approved Vegetable Seed—October, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—continued.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Pumpkin—

Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Tomato—

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

FRUITGROWING.

HORMONE SPRAYS FOR APPLE CROP REGULATION.

Some Preliminary Experiments.*

F. T. BOWMAN, Ph.D., Special Fruit Research Officer; E. C. WHITTAKER, Fruit Officer; P. B. MACKENZIE, Fruit Inspector; and R. B. THOMAS, Fruit Inspector.†

OVER a period of years there has been increasing interest, among apple and pear growers, in sprays which regulate or thin the crop at less expense than hand-thinning. Trials conducted by the Department during the past two seasons indicate the possibility of the use of hormone-type sprays for this purpose.

Several methods of crop regulation are already in use. In some instances removal is effected by caustic sprays, particularly of those varieties which are not wanted in a general "on" year, with the object of having these varieties in crop in a succeeding "light" year. In other instances stripping of the fruit from the tops of trees is done for the beneficial effect on the remaining fruit and on the growth of the tree. This practice has been increasingly adopted over the last few years, and a satisfactory spray to replace hand removal would be highly advantageous. Labour difficulties for harvesting, spraying, etc., have also caused growers' thoughts to turn to crop reduction methods.

Again, there is no doubt that fruit thinning would be practised to a greater extent for its beneficial effect on the fruit, if a cheaper method than hand labour were available. In cluster varieties like Jonathan and Yates apples and Winter Cole pears, which definitely require thinning, a satisfactory spray would cheapen the costs of production. Thinning is also required to promote regular production in most varieties, whilst it is known from experiments (to be discussed later) that in alternate bearing varieties early and drastic thinning of the crop is necessary to break the biennial habit. Practical application of this knowledge has awaited the advent of a satisfactory thinning spray.

Until lately the main type of spray available for apple and pear crop reduction was the caustic type, such as cresylic acid. This "burns" the blossoms and young foliage, and even causes some bark and spur damage. Owing to its liability to cause russeting of the fruit this type of spray could not be used as a crop thinning agency.

Hormone spraying for fruit crop regulation was first tested in New South Wales‡ in spring, 1946, and the results showed that it was obviously superior to the use of caustic type sprays as well as various wax-oil emulsions that were tried. The best of the last-mentioned were good thinning agents, but were very expensive and the trees were difficult to cover subsequently with insecticides or fungicides. It was clear from the first trial that the hormone spray could be used for crop reduction or removal without the damage and disadvantages of the other sprays.

Owing to the heavy bloom of apples and pears in 1947, growers at Orange and Batlow evinced considerable interest in crop thinning and reduction sprays, and the opportunity was taken to arrange large-scale trials. In total about 2,000 trees were involved, including many varieties and trees in various states of vigour and health. The evidence from these trials is to the effect that if the strength of the spray is carefully regulated to the variety and the vigour of the tree, it can be used to thin fruit. Alternatively, it can be used at higher strengths to remove fruit completely from all or part of the tree. This means that a non-caustic spray has become available for entire crop removal or stripping the tops of trees or, subject to

*These tests are in early stages and any recommendations are for experimental purposes only.

†In investigations into crop regulations over a period of years, the following officers actively co-operated: Messrs. J. D. Bryden, J. A. Holbeche, E. C. Levitt, S. A. Thornell and J. B. McGrath.

‡It is desired to acknowledge communications, dated February 1946 from Professor V. R. Gardner, Michigan State College and Associate Professor L. R. Bryant, State College of Washington, U.S.A., on the trial of hormone sprays for thinning in the previous spring in U.S.A.

still further work, for thinning purposes. As control of the "on-year" crop involves one of these methods, this spray seems to offer the key to the alternate and irregular cropping problem in apples and pears.

In Part I of this article the effects of the spray and its use for different varieties and trees of different vigour are described. In Part II the experimental bases leading to the use of thinning sprays for breaking the alternate habit are dealt with.

Part 1.—2, 4D As a Crop-thinning or Removal Spray.

Application and Action of Spray.

Products containing 2, 4-D, made by various suppliers, were used during the first year, but in the second year Methoxone was used exclusively on account of its ready availability for large-scale testing. Methoxone is a 10 per cent. solution of Sodium 4chloro2methylphenoxyacetate and was used at dilutions giving the equivalent of 30, 60 and 90 parts per million of 2, 4-D.

Treatment consisted of one spray, given either separately at full bloom or with the "calyx" spray.

The first action of the spray was on the foliage, which showed a wilted appearance from which complete recovery was made in about two to three weeks, except if the strength was too great for the variety. During this time the blooms and young fruits permanently wilted, died and later dropped off the spur, leaving the spur leaves and new spur growth intact and uninjured.

Depending on the strength used, either all the young fruit was thus removed or only a proportion was removed. In the latter case, giving the effect of thinning, the action was as follows: All the fruit from weak spurs was removed, leaving fruit, often thinned out to singles, on strong spurs.

Where all the spurs on a tree were weak the spray readily removed the fruit. On the other hand, where most of the spurs were strong, even high strengths of the spray effected comparatively little thinning, and the fruit was left in clusters instead of being thinned to singles on the spurs.

In rare instances the spray killed the weakest spurs, with the result, in such instances, that the tree appeared somewhat thinly foliaged; but this loss of weak spurs, which scarcely ever set fruit, was not considered a disadvantage.

When used too strong for the variety, whether apple or pear, the 2, 4-D brought about a permanently curled and pendulous or wilted appearance of the foliage throughout the season. This is a typical curvature-producing effect of a hormone, and it is of interest that crop removal or reduction can be obtained with strengths that do not induce these effects permanently. Abnormal fan-like leaves readily developed on certain varieties, such as Delicious and Crofton, at excessive spray strengths. In several varieties also the fruit that should drop adhered as mummies, as occurs naturally with the variety Cleopatra.

Results.

The detailed effects of various strengths on different varieties is given later (see page 526. It is first necessary to point out in general the advantages and disadvantages of the 2, 4-D spray, with reference to the varieties Jonathan, Granny Smith, Delicious and Democrat on which it has been tested most.

2, 4-D was found to be superior to any of the material tested in the past for blossom thinning or removing. As a crop removal agency it was highly efficient at suitable strengths, except for a few varieties, such as Jonathan. The defruiting strengths did not cause damage to the rest of the tree. Where it was used for spraying fruit off the tops of Granny Smith trees, the fruit remaining on the lower parts of the trees was undamaged and exceptionally well-grown and uniform in size.

When used at weaker strengths as a crop thinning spray; 2, 4-D showed the following advantages over sprays previously available:—

(1) It caused no russeting or other form or marking on the fruit.

(2) It did not damage the foliage. (In some varieties it caused the development of a few fan-shaped leaves, and pears were found to be very subject to a prolonged wilted appearance of the foliage.)

(3) Unlike previously-used crop reduction sprays, 2, 4-D does not require to be carefully "timed" to full bloom: it has been found to be effective when applied from earliest full bloom to "calyx" spray time.

(4) It was used in combination at the latter period with arsenate of lead or DDT without causing injury. Except if it should be thought advisable for any reason to make an application at full bloom, this type of spray, therefore, may be incorporated in the "calyx" spray, thus avoiding the cost of an extra spraying operation.

(5) It is cheap; using Methoxone, the cost of the material approximated ½d. per tree. Thinning by hand is always a labour-consuming and expensive operation even when labour is available. This spray holds promise of bringing to the grower the advantages of thinning at negligible cost.

Effects noted on the thinned trees in various instances were: improved size, more uniform size and improved colour of coloured varieties, particularly Delicious. In several instances a most obvious effect was the elimination of limb breakages. Thinning effected by the sprays applied in 1946 promoted blossoming in 1947. This aspect will be more fully dealt with in Part II of this article.

Precautions are Necessary.

The chief disadvantages are connected with the specific nature of the strengths to use for different varieties and vigour of trees. This means that growers must carry out a certain amount of experimental work on their own account to find out suitable strengths for their particular trees. The particulars given in the table, "Strengths for Different Varieties," page 526, will, however, afford a useful guide.

Causes of Variability in Efficiency.

The pre-harvest or stop-drop hormone sprays were immediately successful because of their general suitability for trees in different degrees of health and vigour, for different varieties and generally for application over a wide range of conditions. Hormone thinning sprays, on the other hand, do not promise to be of such sweeping application. At first it appeared that the results were too variable for general application as a fruit thinning spray. However, closer analyses of the effects showed that the variability had been brought about by four main factors:—

1. *Variety.*—Some varieties were extremely easy to thin or defruit, whilst others were difficult even to thin by the spray. This is related to strengths used, and is dealt with under the heading on "Strengths for Different Varieties."

2. *Vigour of Tree.*—For any particular variety, trees of poor vigour were more easily thinned than vigorous trees. The state of the spurs rather than of the laterals appeared to give the clue to this effect. The strong-spurred type of tree was more difficult to thin than trees with many weak spurs. The long-pruned type of tree, having in reality weak spurs, was very easily stripped of its fruit.

This effect of the spray which follows from its observed action, already discussed, in defruiting weak spurs much more readily than strong spurs, will prove the most difficult to handle in the future use of the spray, first because the dose for a variety will depend upon the grower's assessment of the vigour of his trees, and, second, because the dose will need to be varied during the spraying operation according to the tree-to-tree variations that naturally occur in orchards.

3. *Strength.*—Like pre-harvest hormone sprays, 2, 4-D was used in dilute concentrations, viz.:—

30 parts per million (5* fluid oz. of Methoxone per 100 gallons);

60 parts per million (10 fluid oz. of Methoxone per 100 gallons);

90 parts per million (15 fluid oz. of Methoxone per 100 gallons).

The strength of the spray must be regulated to the variety and vigour of the tree. Pears and a group of sensitive apple varieties, will doubtless require lower strengths.

4. *Thoroughness of Spraying.*—Variation was brought about by the thoroughness of spraying. Being a hormone, 2, 4-D is absorbed by the tree and transported within the tree in the sap, bringing about its effects internally. Light spraying evidently amounted to a reduction of the dose, and heavy spraying, up to the point where excessive amounts ran off the tree, amounted to an increase of the dose given to the tree. The discussion on strengths which follows is based on the thoroughness of spraying required for the "calyx" codling moth spray.

* The precise figure is 4.8 fluid oz.

Spray Strengths for Varieties.

The effect of the strengths at which the spray was used on varieties is summarised below. The varieties are arranged in their order of increasing sensitiveness to the spray.

Variety.	Spray Strength.	Remarks.
Apples.—		
Jonathan ...	90 p.p.m.	Thinned strong trees; over-thinned some weak trees.
	*60 p.p.m.	Thinned fruit in most cases. Only slight effect on strong trees.
	30 p.p.m.	Usually very little thinning effected by this strength.
Granny Smith ...	90 p.p.m.	Defruited trees. In few cases a light crop remained.
	*60 p.p.m.	Usually thinned trees well; overthinned some weak trees.
	30 p.p.m.	Slight thinning effected; strong trees not affected.
Delicious ...	90 p.p.m.	Defruited trees in most cases.
	60 p.p.m.	Usually defruited trees or thinned them excessively.
	*30 p.p.m.	Usually thinned trees satisfactorily; strong trees only slightly thinned.
Democrat ...	90 p.p.m.	Thinned excessively or defruited trees.
	*60 p.p.m.	Gave good thinning; excessive on weaker trees.
	*30 p.p.m.	Slight thinning on strong trees; good thinning on weaker trees.
Yates, Stayman, Crofton, London Pippin, Dougherty, Rome Beauty.	30 p.p.m.	These varieties are the most sensitive to 2, 4-D; this strength defruited them and caused distinct foliage effects. Further work is necessary to establish thinning strengths.
Pears.—		
Winter Cole ...	30 p.p.m.	Defruited trees but "wilted foliage. Higher strengths caused more or less permanent "wilting of foliage.
	*15 p.p.m.	Thinned crop well without serious foliage effects.
Williams, Packham's Late, Packham's Triumph.	30 p.p.m.	Remarks as for Winter Cole.

* Strengths suggested for trial by growers as a thinning spray; higher strength as defruiting spray. Growers wishing to try the sprays are advised to consult District Fruit Officers with a view to deciding upon suitable strengths for their particular trees

Prices of Secondhand Fruit Cases.

THE New South Wales Prices Branch has furnished a schedule of prices of secondhand fruit cases in New South Wales, which supersedes that published on page 474 of September issue of the *Gazette*. It is as follows:

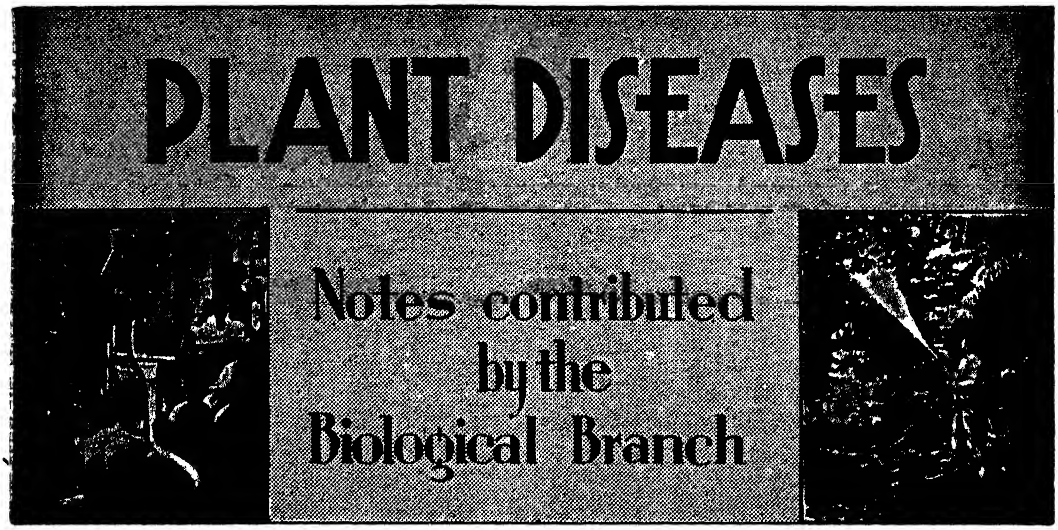
The Schedule.

Maximum Prices per Case—Ex Store or Deliveries other than Free on Rail.

Type of Case	Cases not reconditioned		Reconditioned cases			
			Without lid		With lid	
	Sales by persons other than case dealers	Sales by case dealers	Sales by persons other than case dealers	Sales by case dealers	Sales by persons other than case dealers	Sales by case dealers
	each d.	each d.	each d.	each d.	each s. d.	each s. d.
Standard North-west bushel ...	4	7	6	9	8½	11½
Standard Cherry—¼ bushel	2	3	3	4	4½	5½
Half bushel grape	3	5	5	7	7	9
Half bushel dump	3	5	5	7	7	9
Long tomato—½ bushel	3	5	5	7	7	9
¾ bushel export pear...	4	7	6	9	8½	11½
¾ bushel export grape	4	7	6	9	11	1 2
Australian bushel dump	4	7	6	9	8½	11½
2 bushel crate...	6	9	8	11	1 0	1 3
Banana case	6	9	8	11	1 0	1 3
Export citrus	6	9	8	11	1 0	1 3
Melon crate	4	7	6	9	8½	11½
Any one bushel case with hinged lid	4½	7½	...	...	9	1 0
Any half bushel case with hinged lid	3½	5½	...	...	7½	9½

NOTE—For cases sanded all over add to scheduled prices the following:—
(a) one bushel capacity or over—1½d. each. (b) under one bushel capacity—1d. each.

—DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS.



POWDERY MILDEWS.

THIS group of fungous parasites is most active during the summer and autumn months. A wide range of plants, including vegetables, ornamentals, fruit trees and vines, are subject to attack, but as a rule each race or strain of the powdery mildew fungus is restricted in its attacks to a particular host, or group of related hosts. One strain, for example, attacks peas, another roses, a third marrows, pumpkins, squashes and melons, and so on.

Symptoms.

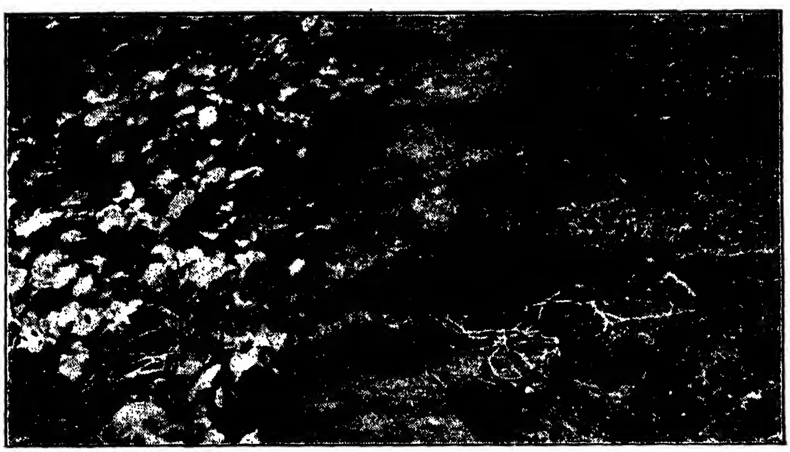
The first signs of the diseases are the appearance of small, white, circular patches on young stems and leaves. These increase in size, often running together, to cover extensive areas of leaf surface, and become powdery or mealy owing to the production of masses of spores which disseminate the disease to the young foliage as it is formed. Unlike most leaf-attacking fungi, which require humid conditions for their development, the powdery mildews are able to flourish under quite dry conditions. Nightly dews provide sufficient moisture to allow infection to spread.

The fungus is, in most cases, almost entirely external, developing a mass of

Rockmelons showing the Effect of a Severe Attack of Powdery Mildew.

Left.—Sprayed with Bordeaux mixture.

Right.—Unsprayed plot.



Powdery Mildew of the Rose.

fungous threads and spores on the surface of leaves and young green stems. Small peg-like processes are sent down into the surface cells of the host, and by means of these the fungus extracts the necessary food material. Considerable distortion, and reduction in leaf size, can be caused, with consequent effect on the flower and crop production.

Because of the nature of its growth, the presence of powdery mildew on the surface of a leaf greatly increases the rate at which water is evaporated from the plant surfaces.

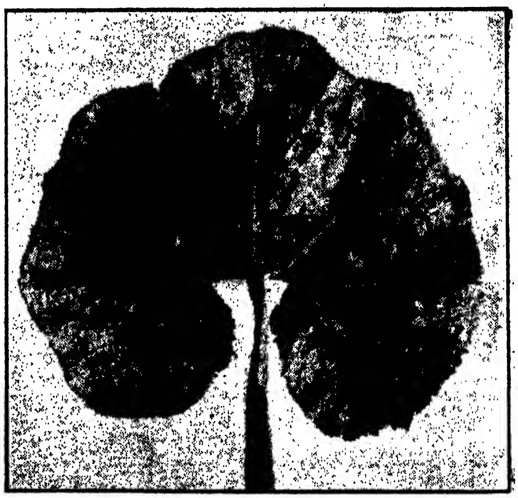
Control.

With powdery mildews as with most other plant diseases prevention is better than cure, and often considerable damage may be done before the disease can be detected.

Plants subject to powdery mildew should be dusted regularly with a dusting sulphur, or a mixture of hydrated lime and finely divided sulphur.

Some varieties of plants need special treatment. Rockmelons and cucumbers are subject to scald if dusted with sulphur, and should, therefore, be sprayed at weekly intervals with Bordeaux mixture 3-4-40 instead. The rockmelon variety, Powdery Mildew Resistant 45, shows a high degree of resistance to this disease. Related plants such as pumpkins and squashes may safely be dusted with sulphur. In the case of powdery mildew of apples, obviously affected shoots should be removed and burned during the winter pruning activities. Subsequent sulphur sprays applied for black spot will contribute to the control.

Following is a list of the plants more commonly affected with powdery mildews:—Rockmelon, pumpkin, marrow, squash, cucumber, vines, apple, pawpaw, rose, delphinium, hydrangea, sweet pea, Michaelmas daisy and verbena. Pea, chrysanthemum and dahlia are also frequently affected, but usually not seriously enough to warrant the use of control measures.



Powdery Mildew on the Under-surface of a Pumpkin Leaf.

DOWNY MILDEW OF GRAPES.

LATE spring and early summer of last year saw the worst outbreak of downy mildew on coast and tableland grape vines that has occurred for many years. In some districts almost continuous rain made it difficult or impossible to spray at regular intervals with the result that much defoliation and injury to fruit and canes was experienced.

The disease is caused by a fungus, *Plasmopara viticola,* which attacks leaves, shoots and berries. Under ordinary conditions it is largely confined to the leaves where it produces discoloured spots which prevent the normal activities of the leaf and consequently cause a reduction of the grape crop. The quality of grapes and wine produced is also affected.

Symptoms.

The first indication of the disease on the leaves is the development of dark, oily-looking patches on the upper surface, which later turn yellow and then brown. On the lower surface the spots are at first not so evident, but later become white and downy owing to the formation of masses of fungus spores. These spores are carried to the younger foliage, where they produce new infections, thus spreading the disease during the growing season.

Early Stages of Downy Mildew on Under-surface of Leaf of Zante Currant.

Heavily infected leaves shrivel and fall prematurely.

On the fruit the first sign of infection is a hardening of the berry and a change from the normal colour to a greyish-blue shade. It is during this stage that the mildew

appears. In later stages the berry withers, turns brown or red and finally shrivels into a mummy.

Late attacks of downy mildew severely affect the vitality of canes required for the following season and badly affected canes may be killed.

Control.

Bordeaux mixture is most effective in the control of this fungus, and an endeavour should be made to keep a coating of spray continuously on the vine to prevent infection taking place. Bordeaux mixture must be applied before the disease makes its appearance in order to ensure adequate protection. No hard-and-fast rule can be laid down as to the time of spraying, since the outbreak of the disease is largely dependent upon prevailing weather conditions.

Where black spot has also to be controlled, the first spray (strength 6-4-40) should be applied when the early buds are bursting. Where black spot is not a problem, the first spray (strength 6-4-50) can be applied when the shoots are about 9 inches long.

If weather conditions are moist, spraying should be done at fortnightly intervals throughout the growing season.

NEW PLANT DISEASES.

DURING the six months ended 30th June, 1948, the following diseases were recorded for the first time in New South Wales:—

Acacia decurrens (Golden Wattle)—*Verticillium dahliae* Kleb. (Die back); Metropolitan Area.

Amsinckia hispida (Yellow burr weed)—*Sclerotinia sclerotiorum* (Lib.) Mass. (Stem Rot); Leeton.

Arachis hypogea (Peanut)—*Sclerotinia minor,* I. C. Jagger (Root and Crown Rot); Yanco.

Amygdalus persica nectarina (Nectarine)—*Gloeodes pomigena* (Schw.) A. S. Colby (Sooty Blotch); Glenfield. Shrivel (non-parasitic); Orange.

Amygdalus persica (Peach)—*Gloeodes pomigena* (Schw.) A. S. Colby (Sooty Blotch); Glenfield. *Phytophthora cinnamomi* Rands. (Collar Rot and Gummosis of nursery trees); Metropolitan.

Betula alba (Birch)—*Cylindrosporium betulae,* Davis and *Gloeosporium betularum,* Ell. et Mark (Leaf spots); Leura, Moss Vale, Metropolitan. *Melampsoridium betulae* (Schum.) Arth. (Rust); Leura.

Capsicum annuum (Chili)—*Phoma* (?) *destructiva* (Ripe Rot); Metropolitan.

Citrus sinensis (Orange)—*Corticium salmonicolor* B. & Br. (Pink Disease); Clarence River.

Clivea miniata (Clivea)—*Stagonospora curtisii* (Berk.) Sacc. (Scorch); Botanic Gardens.

Crinum sp. (Crinum)—*Stagonospora curtisii* (Berk.) Sacc. (Red Stripe); Metropolitan.

Cymbidium sp. (Orchid)—*Sclerotium rolfsii* Sacc. (Basal sheath rot); Metropolitan.

Cyphomandra betacea (Tree Tomato)—Spotted wilt (virus); Metropolitan. *Oidium* sp. (Powdery Mildew); Metropolitan.

Ficus carica (Fig)—*Kuehneola fici* Butl. (Rust); Byron Bay.

Fortunella japonica (Kumquat)—*Sphaceloma fawcettii scabiosa* Jenkins (Scab); Metropolitan.

Hyacinthus sp. (Hyacinth)—*Bacterium carotovorum* (Jones) K. B. Lehmann (Soft Rot); Orange.

Iris germanica (Flag Iris)—*Phytophthora* sp. (Rhizome Rot); Metropolitan.

Lathyrus odorata (Sweet Pea)—*Glomerella cingulata* (Ston.) Spauld. and Schrenk. (Leaf Spot); Murwillumbah.

Lilium philippense (Philippine Lily)—*Phytophthora cinnamomi* Rands. (Root and Bulb Rot); Metropolitan, Wyong.

Malus sylvestris (Apple)—*Gloeodes pomigena* (Schw.) A. S. Colby (Sooty Blotch); Coast and Tablelands. *Leptothyrium pomi* (Mont. & Fr.) Sacc. (Flyspeck); Oakdale.

Olea europea (Olive)—*Phytophthora cinnamomi* Rands. (Root Rot); Metropolitan.

(Continued on page 536.)

NEW INSECTICIDES AND FRUIT FLY CONTROL.

S. L. ALLMAN, M.Sc., B.Sc.Agr., Senior Entomologist, and
A. H. FRIEND, B.Sc.Agr., Entomologist.

THE introduction of the newer type insecticides—commencing with DDT and its widely publicised residual effect against the common housefly—have naturally drawn attention to the possibility of using these materials against fruit flies.

Accepted fruit fly control practice has been the weekly or twice-weekly application of foliage poison sprays to patches of foliage, but DDT and similar insecticides gave promise of a protective all-over cover spray for fruit and foliage. Two or three cover sprays during the five or six weeks prior to fruit maturity could be expected to reduce fly infestation to a minimum if an effective spray with residual action could be maintained.

In order to obtain specific information on the possibility of using protective cover sprays with the new insecticides, a test was arranged in a suburban orchard. The species concerned in this test was the Queensland Fruit Fly (*Strumeta tryoni*). It is of interest to record that the Mediterranean Fruit Fly (*Ceratitis capitata*) has not been taken in this State since 1941.

DDT cover sprays have been tried by many orchardists and have been accepted as recommended practice on citrus and passion fruits in Queensland. Grower tests in this State have generally not proved as successful as anticipated, though DDT applications on citrus, particularly grapefruit, appeared rather more effective than on pome and stone fruits. Further, DDT was by no means the answer to the difficult problem of fruit fly control on odd trees in home gardens.

Control Methods and Insecticides Used.

The tartar-emetic foliage poison spray prescribed under the Plant Diseases Act for fruit fly control was included in the test as a basis for comparison. The mixture used in the test consisted of 2 oz. of tartar emetic and 2½ lb. of sugar dissolved in 4 gallons of water. This bait is used by spraying or splashing at least 6 fluid ounces on the foliage once a week during the five weeks preceding the harvesting of the fruit. Commercial growers generally apply the bait twice a week, and this practice was followed in the present test. One gallon of material was used for seventeen trees and the amount per tree was therefore approximately 9 fluid ounces per application which was made by means of splashing with a kalsomine brush.

Two commercially available DDT agricultural emulsions were tested. They were applied at 0.2 per cent. or twice the strength normally recommended, and three applications were made at intervals of fourteen days. In order to encourage feeding by fruit flies and so obtain a stomach poison effect as well as a contact effect, 1 lb. of white sugar was added to each 10 gallons of diluted spray. The cover spray was

Application of Protective Fruit Fly Cover Spray
[Photo: J. M. Rogers.

applied by means of a power outfit, the aim being to give a reasonable cover using approximately 1 gallon per tree.

Benzene hexachloride (BHC), another newly developed insecticide usually somewhat quicker in its action than DDT, was also tested. The spray was made by dissolving the crude BHC (containing 13 per cent. of the active principle or gamma isomer) in xylene and adding a suitable emulsifier. This material was diluted to give a 0.2 per cent. (gamma isomer) emulsion in order to make a direct comparison with DDT.

Chlordane, an insecticide of still more recent origin which has been used very successfully against a wide variety of pests and has been reported to possess a very pronounced residual effect, was available in sufficient quantity to use on a small plot. This material was emulsified in the same manner as the BHC and, again, a 0.2 per cent. spray was applied.

Sugar was also included in the BHC and Chlordane sprays and the method of application was similar to that used for the DDT plots.

Test Plots and Details of Treatments.

A group of ninety-two medium to large-sized Narrabeen plums, located at Turramurra, were made available for the tests. These trees were divided into five blocks, ranging from twelve to twenty-six trees per block, and so arranged that test plots of eight or nine trees from each block were in alignment and equally exposed to infestation. A light to medium crop only was carried.

Treatments, both baiting and cover sprayings, commenced on 3rd December, when the fruits were quite green and approximately one inch in diameter. During the six weeks period until harvesting was completed, three cover sprays and eleven foliage poison baitings were applied to the respective plots.

Seasonal Conditions.

Weather conditions were unusually difficult for fruit fly control operations and a total of 1,340 points of rain, falling on twenty-one days, were recorded in the 42-day period of test. The average mean temperature was 68.8 deg. Fahr. compared with the average of 71.5 deg. Fahr. of the past eighty years. It is considered that, as a result of these factors, fruit fly activity was at a relatively low level.

Following the extremely heavy infestation of the previous year, the 1947-48 season commenced with the usual burst of fly activity in loquats and in some early-maturing peaches, and was then followed by the normal seasonal respite in November and early December. A build-up was noted in late December, but this did not develop into the expected general infestation usually associated with fruits ripening in the early new year. However, a general infestation became obvious from mid-February onwards, when figs, citrus, apples, pears and blackberries were heavily infested in various localities.

Results of Experiment.

Two pickings of the Narrabeen plums were made during the periods 7-9th and 13-16th January, respectively. The fruits from each tree were inspected and classed as clean or "stung" and a complete record was kept for each tree in both the test plots and the larger blocks.

The results of the various treatments are set out in the following table which shows the percentage of clean fruit in the test plots and also in the treated blocks in which the test plots were located.

Percentage of Clean Fruit Harvested in the Various Treatments.*

Treatment.	No. of Trees in Test Plots and Blocks.	No. of Fruit Examined.	Percentage of Fruit Clean.
Tartar-emetic foliage poison sprays	8 **17**	1304 **2531**	93·2 **93·8**
DDT (No. 1) cover sprays	9 **20**	1595 **3416**	92·5 **92·3**
DDT (No. 2) cover sprays	9 **26**	1777 **3775**	86·8 **85·9**
BHC cover sprays	9 **17**	1808 **3332**	66·3 **69·7**
Chlordane cover sprays	9 **12**	3417 **4451**	52·5 **56·1**

* Figures in bold type refer to total counts from all treated trees in the various blocks, including also those of the eight or nine tree test plots.

Discussion of Results.

Although, as previously stated, the effect of the climatic conditions was the harvesting of a crop of fruit cleaner than would normally be expected, it is evident from the results tabled above that fruit fly was still

active. Benzene hexachloride- and Chlordane-sprayed blocks were infested to a very considerable degree and did not measure up to either of the DDT sprayed blocks or the one receiving the conventional tartar emetic foliage poison bait.

As the treatments were not replicated in this experiment it is impossible to state definitely whether 0.2 per cent. DDT cover sprays are to be preferred to tartar emetic foliage poison sprays, but it is obvious that both treatments have given an appreciable degree of control. In addition to the direct comparison available with the BHC and Chlordane-treated blocks a survey was made of the fly infestation present in trees of the surrounding home gardens. Fruit on these trees was found to be heavily infested and the average loss was estimated at about 75 per cent.

Some marking of the plum skin was noted where cover sprays were applied, but this was never sufficiently pronounced to lower the grade of the fruit. It is considered possible that this marking was due to the sugar included in the spray and not to the various insecticides.

The cost per season of the materials required for cover sprays worked out at approximately 1s. per tree, whereas the comparative cost for bait was only 6d. In addition, cover sprays require power equipment and several men for effective application, while the bait may be simply and effectively applied by splash treatment with a kalsomine brush. More elaborate equipment is certainly often used for the application of foliage poison baits but even so, a considerable advantage in cost, time and labour still remains with this baiting method.

An interesting feature of this test was the demonstration that foliage poison sprays can be effectively maintained on trees in spite of almost continuous wet weather. Although rain fell on twenty-one of the forty-two days involved, the bait could be readily observed, and the results obtained clearly indicate that the fly infestation was substantially reduced by comparison with the BHC and Chlordane plots.

Summary.

Tartar emetic-sugar foliage poison baits applied twice weekly, and 0.2 per cent. DDT cover sprays at fortnightly intervals, have both given appreciable control of fruit fly on Narrabeen plums but, owing to the nature of the experimental layout, it is not possible to state which is the more effective method. However, the conventional bait application has a considerable advantage over cover spraying when costs, equipment and labour are taken into account.

Queensland Fruit Fly Feeding on Foliage Poison Spray in a Cage Test.

[*Slightly enlarged.*

Benzene hexachloride and Chlordane cover sprays were relatively ineffective in preventing infestation.

Tartar emetic foliage poison spray was maintained on the trees in spite of almost continuous wet weather, involving every second day of the test period.

Acknowledgment.

The co-operation of Mr. F. Chilton, who made available the orchard block and spraying equipment, is gratefully acknowledged. The writers are also indebted to Mr. F. Thomas, Fruit Inspector, who assisted considerably in the various phases of the experiment.

CONTROL OF MICE AND RATS

On the Farm.

E. H. ZECK, Entomologist.

MICE and rats cause great loss of foodstuffs and other materials stored on farms. Producers should in their own and the nation's interest, adopt all possible means of preventing these vermin from gaining access to material liable to damage, and should also carry out a control campaign if infestation occurs. The purpose of this article is to set out the Department's suggestions for control of these pests.

Field mice live in burrows and feed upon seeds and herbage. Under favourable conditions they breed rapidly, and may attain plague numbers.

Buildings, and stacks of hay and grain on farms may then be invaded, particularly during cold weather, and continuous invasions by swarms migrating from the paddocks may take place. Later, there may be a further increase in numbers during the spring.

Probably the greatest damage is done to hay, which in many instances may be practically ruined.

Damage to various materials, such as harness, linings of collars, etc., and other leather articles may occur, and rugs and similar materials may be destroyed. Grain may be eaten and destroyed and bags may be damaged beyond repair.

Prevention of Infestation.

Infestations of materials may best be prevented by storing in mouse-proof and rat-proof buildings. Where hay is being conserved it may be protected from rats and mice by stacking on straddles, built in the open, the posts being capped with galvanised iron squares.*

Where a straddle is used, it is essential to ensure that no weeds are allowed to grow up against it, and no loose material is allowed to hang down from it. Implements, such as rakes, pitchforks or ladders, etc., must not at any time be allowed to lean against it, as rats and mice will readily gain entry to the stack by these routes.

A recommended method of protecting grain is to place it on platforms, built on drums, such as 44-gallon petrol or kerosene drums.

Where flat iron is available, a mouse-proof fence may be built around buildings or stacks. Flat iron sheets 3 feet wide are used. One edge is turned out at right angles for about 6 inches, and the sheets placed in a trench 6 inches deep, with the turned edge away from the stack or building. Posts of sawn timber are spaced the length of the sheets apart, and the iron tacked on to them, allowing about 2 inches overlap. The posts are the height of the fence and a cap is placed over each post to prevent the mice climbing up the end of the iron.

Control.

Control of rats and mice may be obtained by the following means, according to circumstances:—Poisoning, trapping, and fumigation.

Poisoning.—

Where plagues of rats and mice occur, poison baits offer the most practical means of control. The destruction of mice in paddocks is very difficult owing to the areas to be covered, and also there is a risk of poisoning farm animals and birds.

The poisons and poison baits should be kept out of reach of children and irresponsible persons.

Mice may be destroyed by means of poisoned grain, and other poisoned foodstuffs.

* Particulars of the method of constructing a hay straddle were given in the April, 1948, issue of the *Gazette*, and reprints may be obtained from the Department.

Poisoned Grain.

Finely powdered strychnine	1 oz.
Baking soda	1 oz.
Sugar	1 cup
Starch	½ cup
(or flour 3 tablespoons.)	
Wheat	20 lb.

To prepare this bait add the starch, sugar, baking soda and strychnine to a quart of water; heat gently, and stir continuously until a clear paste has formed. Pour the paste over the grain and mix thoroughly, so that every grain is coated, then spread out to dry.

Poisoned Meal.

Finely powdered strychnine	1 oz.
Sugar	½ cup
Fine oatmeal or wheatmeal	10 lb.

Mix thoroughly, and place out in saucers or lids of tins, etc.

It must be remembered that strychnine is a virulent poison, acting with great rapidity, and particular care must be taken where it is used, owing to the risk of persons, domestic and other animals, and birds being poisoned.

BAIT SUBSTANCES.

Poisons may be incorporated with various substances when baiting. Slices of apple, linseed meal, carrots, sunflower seeds, fats, bacon, fish, meat, stale bread, fresh sliced vegetables, etc., may all be used. Whatever substance is used, it should be varied from time to time.

Under dry conditions moist baits are often more acceptable than those in a dry state.

At times baits may be picked up by rats and mice and carried away to places where they may be eaten by other animals or birds. Where this is likely to occur, the use of baits that contain sufficient moisture to ensure that they cannot be readily carried will obviate this risk. Where wet baits are uneaten, however, they should be collected the following morning and destroyed, as when left exposed in warm situations, souring and chemical changes may take place, and render them unacceptable or ineffective.

Water supplies should be protected from rat or mice contamination, as frequently, after poisoning, these animals become thirsty, and may seek water.

Barium Carbonate.—This chemical is a relatively mild poison, but as with all poisons, baits containing it must be kept away from domestic animals, etc. Its action is slow and usually permits rats to leave buildings before death intervenes.

It is used at the rate of one part, by weight, to four parts of bait substance.

Red Squill Powder.—This powder is relatively harmless to human beings and domestic animals, and in most instances cats, dogs and fowls, either refuse baits containing it, or if they do eat them, promptly regurgitate them.

It is used at the rate of one part, by weight, to sixteen parts of bait. It may be mixed with a little water to form a thin paste, or mixed dry with the bait, depending upon the substance used.

M. 109.—Proprietary baits or poisons containing M. 109 are available, and these should be mixed with the bait substance according to instructions on the containers. This comparatively new rat poison is particularly useful against brown rats and grey rats. It is relatively non-toxic to man.

Other Poisons.—Various other poisons are used in baits for the control of rats and mice.

Zinc phosphide is used at the rate of one part, by weight, to twenty parts of bait. It will kill all forms of animal life if eaten in sufficient amount.

Powdered white arsenic, which is tasteless and odourless, is used at the rate of one part, by weight, to sixteen parts of bait.

Thallium sulphate is used at the rate of one part, by weight, to eighty parts of bait. This is a cumulative and powerful poison, which acts slowly, but is positive in its results. It may be used in buildings, but is not considered safe to use about farms. Gloves should be used in handling it.

Phosphorus is sometimes used, but as it is dangerously poisonous to other animals, and no effective antidote is available, its use is not recommended.

Use of Traps.—

Various types of water traps, such as petrol or kerosene tins sunk to ground level and about two-thirds filled with water, are used to trap mice. These traps are fitted

with a revolving tin on which the mice jump, and fall into the water.

Wooden cases lined with smooth tin may also be used as traps. Loose grain and chaff are placed in the case, and boards or bags are provided on the outside for the mice to climb up. The mice jump into the case to obtain the food, and cannot climb out.

The most useful type of trap for rats is the "break-back" spring trap. Smaller traps of the same type may be used where only a few mice are present in buildings.

Fumigation.—

Where rat tunnels are noticed, poison gas, such as that given off by calcium cyanide, may be blown down the burrows, which can then be closed up as in the fumigation of rabbit burrows. These gases are amongst the most poisonous known, and work with them should only be performed by experts. Under certain circumstances stacks of grain and hay may also be fumigated.

Another 1,000-lb. Butter Cow.

"GRESFORD CLARIA" (6501), a pure-bred Jersey cow owned by Mrs. P. Merchant, "Clevedon," East Gresford, has completed a 365-day record, producing 16,897½ lb. milk, 5.4 per cent. average test and 905.84 lb. butterfat at the age of 6 years and 8 months. This amount of butterfat is equal to 1,104.68 lb. commercial butter.

These figures were established under the Rules of the Division 1 (Official Section), of the Herd Production Improvement Scheme administered by the New South Wales Department of Agriculture.

"Gresford Claria" is the 41st Jersey in New South Wales which has produced over 1,000 lb. butter in twelve months.

"Gresford Claria" (6501) was sired by "Richmond Garibaldi" (15068) from "Belgrave Winsome" (70254) which was by "Belgrave June's King" (11360) ex "Jerseymead Peggy 2nd" (30755) which, as a mature cow, produced 395 lb. butterfat in 273 days. "Jerseymead June 2nd," the dam of "Belgrave June's King" (11360), produced in 273 days, 516 lb. butterfat.

On the sire's side the pedigree is particularly interesting. "Richmond Garibaldi" (15068) being sired by "Richmond Nemesis" (8367) a "merit" bull under the Department's Register of Merit Scheme having ten daughters in the Register of Merit, which have averaged 406 lb. butterfat in 273 days.

"Nemesis" sire, "Asters Diamond King" Imp. N.Z. (2649) is also a "merit" bull with twelve daughters averaging 409 lb. butterfat.

The dam of "Richmond Garibaldi," "Richmond Gladsome 3rd" (29977) is a Lifetime Register of Merit cow, having produced 3,224.9 lb. butterfat in seven lactations, while her sire, "Kingfisher of Bathurst" (4608), is by the famous "Goddington Noble 15th" (Imp.) that sired the equally famous "Wagga Gladys" which had, as a dam, "Wagga Gladsome" the dam of "Richmond Gladsome 3rd."

Plant Diseases—*continued from page* 530.

Salvia splendens (Salvia)—Greening ((?) Big Bud virus); Grafton.

Soja max (Soybean)—Soja virus 1 Gard. & Kend. (Mosaic); Grafton. *Cercospora diazu* Miura (Leaf Spot or Frog Eye Spot); Grafton.

Solanum nigrum (Nightshade)—Witches Broom ((?) Big Bud virus); Leeton.

Sonchus oleraceus (Milk Thistle)—Greening ((?) Big Bud virus); Leeton.

Tamarix aphylla (Athel Tree)—*Heterodera marioni* (Cornu) Goodey (Root Knot); Metropolitan.

Trifolium pratense (Red Clover)—*Sclerotium rolfsii* Sacc. (Stem Rot); Glen Innes.

Ulmus sp. (Elm)—*Septogloeum ulmi* Died. (Leaf Spot); Sutton Forest.

Xanthium spinosum (Bathurst Burr)—*Colletotrichum* sp. (Stem Spot and Seedling Collar Rot); Inverell, Merriwa.

INSECT PESTS.

Notes contributed by the Entomological branch.

E605—An Interesting New Insecticide.

E605 (diethyl nitrophenyl thiophosphate), a new insecticide of German origin, known also as Parathion, Thiophos and 3422, has attracted considerable attention during the past year, and has been tested overseas against many insect pests. This insecticide is apparently effective against a very wide range of pests, and in this respect is superior to the now universally known DDT. Unfortunately E605 is reputed to be very toxic to man and warm-blooded animals, and until further details are available, recommendations for its use and permissible residues cannot be given.

The widespread use of DDT, and shortage of nicotine sulphate, raised a number of spray combination problems, particularly in orchards where it was desired to control woolly aphids, aphids generally, and red spiders. HETP (hexaethyl tetraphosphate), a related compound to E605, partly solved these problems, but this insecticide has several disabilities, including rapid breakdown when mixed with water, and incompatability with the commonly used fungicides, Bordeaux mixture and lime-sulphur. This incompatability prevents the application of combination sprays early in the season, when the emphasis is more on disease control, although an aphicide might often be included with advantage.

E605 is a heavy liquid of unpleasant "rotting onion" odour, insoluble in water, and, in contrast to HETP, is not hydrolysed or broken down in water. It is also compatible with a wide range of insecticides and fungicides and, according to some sources, stable in alkaline media, including hydrated lime, lime-sulphur and Bordeaux mixture. An insecticide with these characteristics would, therefore, be a definite gain in planning combined spray programmes.

Supplies of E605 have been limited in this State but a number of small-scale tests have been made and the results are set out below.

Olive Lace Bug (*Froggattia olivina*).

Tested at a concentration of 1 in 10,000 against a heavy infestation of nymphs and adults. Light showers of rain fell a few hours after spraying. Examination after 24 hours indicated an excellent kill of all stages of bugs, and, in addition, numbers of ants (*Iridomyrmex* sp.) were also killed. A comparative test, using HETP, 1 in 1600, gave almost equally good results, but the concentration in this instance was six times greater than that used for the E605.—P. C. HELY, Entomologist.

Green Peach Aphid (*Myzus persicae*).

Heavy infestations on celery were sprayed with the following mixtures:—

(*a*) E605 1 in 10,000.

(*b*) E605 1 in 10,000 plus Bordeaux mixture 1:1:40.

(*c*) E605 1 in 10,000 plus lime-sulphur 1 in 100.

The mixtures were applied immediately on mixing and the remaining material allowed to stand for 24 hours and further test sprayings made. The "knockdown" and kill of aphids was of the same order with each of the six treatments and no incompatability or breakdown was evident.—A. H. FRIEND, Entomologist.

House Fly (*Musca domestica*).

A kitchen, 18 feet x 8 feet x 9 feet, was sprayed with ½-gallon of 0.7 per cent. E605 by means of a knapsack pump. For a week preceding the treatment ten to twenty active flies were to be seen during the day, but none was seen immediately following the treatment. One fly was noted seven days after treatment but soon disappeared and freedom from flies was still

maintained after three weeks.—A. H. FRIEND, Entomologist.

Fowl Lice (*Eomenacanthus stramineus* (predominantly), and *Goniocotes gigas*), and **Fowl Mite** (*Dermanyssus gallinae*).

One-quarter pint of 7.8 per cent. E605 (concentrate diluted 1 in 10 with water) was painted on to approximately 150 feet of perches and nest railings of a poultry house in which twenty-five fowls were kept. Paper was spread under the perches and examined from time to time.

Large numbers of live fowl mites and a few dead poultry lice were noted. Fowls were examined periodically and five days after treatment a large reduction in lice population was evident, although some birds were still carrying numbers of lice. The inner walls of the house, perches and nests were then sprayed with two gallons of 0.7 per cent. E605 and paper again spread under the perches. One live engorged mite only was collected.

Fifteen days after the initial treatment the fowls used in the test were closely examined, and of these, two only were found to be infested with lice. The two infested fowls were treated by rubbing 1 gram of 2 per cent. E605 powder into the feathers of the underside. Lice immediately migrated from the treated area and, in a few minutes, had either left the fowls or were dead or dying amongst the feathers. The dusted fowls were cooped separately for a further week and remained free of lice. Eggs laid by these fowls were cooked and sampled by various observers and found to be free of taint.—A. H. FRIEND, Entomologist.

DDT AND CODLING MOTH CONTROL.

E. J. WASON, B.Sc.Agr., Entomologist, and N. C. LLOYD, B.Sc.Agr., Entomologist.

AS a result of experiments carried out in this State during the past three seasons, the following comments are made concerning the use of DDT for the control of codling moth.

It can be definitely stated that DDT has proved to be the outstanding insecticide tested to date, but that its continuous or excessive use is followed by increased populations of woolly aphids and tetranychid mites (red mite and red spider) to the point where they become serious pests.

Normally, woolly aphids and mites are kept below pest numbers by several effective parasites and predators, which are largely destroyed by the use of DDT, and the balance thus upset. There are also indications that pear leaf blister mite can increase sufficiently to assume pest proportions on DDT sprayed trees.

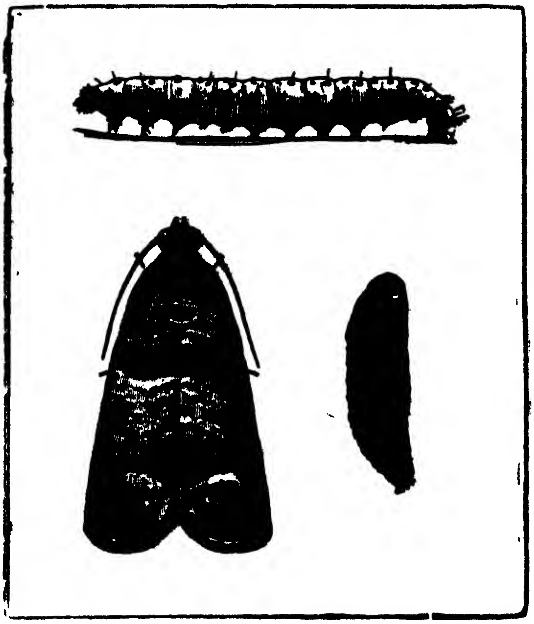
On the credit side is the fact that DDT is a very effective control for apple leaf-hopper and apparently tends to arrest the development of San José scale.

A Programme to Eliminate the Spring Brood.

Where growers are desirous of using DDT, it is recommended that the programme should be designed to eliminate the spring brood. This aim is common to all codling moth control programmes, but sufficiently effective insecticides have hitherto not been available to give any hope of control without applying a number of follow-up, second brood sprays throughout the summer.

DDT is used at a concentration of 0.1 per cent. and it is considered that four, or at the most five, properly-timed sprays, depending on the locality concerned, should result in the reduction of the spring brood to harmless proportions, and so do away with the need for summer sprays for second brood control.

The first spray, commonly known as the calyx spray, can be applied with safety after all the petals have fallen, and the same need for exact timing is not essential as with the lead arsenate spray. The remaining cover sprays should be applied every two to three weeks. It has become the practice in some districts to apply the second spray two weeks after the calyx spray as the young fruits grow rapidly at this stage. Under hot dry conditions favourable for moth activity the shorter interval between the cover sprays is also favoured. On the above basis four sprays would be applied by mid-December and would cover



Larva, Pupa and Adult of Codling Moth.

adequately the period of spring brood activity.

A thorough coverage of developing fruit and foliage is just as essential where DDT is used as with lead arsenate if the above objective is to be attained.

To Avoid Aphid and Mite Build up.

DDT applications later than mid-December are not desirable if the build up of woolly aphid and mites is to be kept to a minimum.

The woolly aphid parasite (*Aphelinus mali*) normally does not become really active until after late December, and if the use of DDT is confined to the early part of the season the surviving parasites can multiply sufficiently during January and February to ensure reasonably effective control of woolly aphid during the autumn months. At the same time supplementary measures, such as the leaving of several heavily aphid-infested trees scattered throughout the block unsprayed (with the removal of the normally light crop from such trees), will ensure a reasonable survival of parasites which can spread throughout the orchard when DDT sprays are discontinued. The saving of infested prunings prior to the application of a dormant oil will also assist in maintaining the population of *Aphelinus mali* in aphid-infested orchards.

Red spiders normally first appear in numbers on the trees about mid-December, and a rapid increase takes place during the following two to three months. A limited DDT programme may not avoid the necessity of mite control sprays altogether, but the risk of heavy mite populations would be considerably reduced.

The Use of Lime-sulphur and HETP.

In districts where lime-sulphur is much used for the control of black spot, the build-up of the mite is largely prevented. In such districts, mite control sprays may not be necessary, but if they are, control may be obtained by using dispersible or colloidal sulphur 2 lb. to 100 gallons, preferably combined with the final DDT spray for codling moth in December.

In warmer districts, such as the Murrumbidgee Irrigation Area, the use of the above sulphur sprays during very hot weather is not recommended. In this case HETP (hexaethyl tetraphosphate) 1 in 1600, plus a neutral wetting agent, is recommended. As this spray has no ovicidal properties, a second application should be given after an interval of 10 to 12 days. The first application should be given with the last DDT cover spray in December, the second to follow 10 to 12 days later. This HETP will also give good control of the woolly aphid, provided it is applied at a high pressure as a coarse drenching spray.

Calyx Stage—Correct Stage for Spraying.

HETP cannot be used effectively with Bordeaux mixture, lime-sulphur, white oil or lime casein spreader, and should not be applied to trees within seven days after the application of any of the above materials.

The application of a dormant oil will destroy the over-wintering eggs of red mite on the trees, but it should be remembered that a large proportion of these eggs are deposited in the soil and rubbish around the bases of trees. The red spider, over-winters in the mature and immature stages in the soil, and a dormant spray will, therefore, exercise no control.

Where growers intend to combine DDT with lime-sulphur for control of black spot, care should be taken that oil-base forms of DDT are not used as these forms are not compatible with lime-sulphur.

NEW INSECTICIDES ON APHIDS.

Some Preliminary Tests.

J. G. G. GELLATLEY, B.Sc.Agr., Assistant Entomologist.

DURING the month of August, the green peach aphid (*Myzus persicae*) and the slaty-grey aphid (*Brevicoryne brassicae*) were very numerous on cabbages grown in the insectary ground, Botanic Gardens, and provided an opportunity to carry out some small-scale tests with several of the new insecticides. A heavy infestation of the green peach aphid also developed on celery and was included in the tests.

Insecticides.

The insecticides tested included a proprietary DDT-nicotine-naphthalene insecticide, HETP (hexaethyl tetraphosphate), TEPP (tetraethyl pyrophosphate) and E605 (diethyl paranitrophenyl thiophosphate). The above insecticides were used in the following concentrations and a neutral spreader (Agral L) 3 oz. per 100 gals. was included where indicated:

(*a*) TEPP, 1 in 2,000.

(*b*) HETP plus Agral L, 1 in 2,000.

(*c*) DDT-nicotine-naphthalene, 1 in 800.

(*d*) DDT-nicotine-naphthalene plus Agral L, 1 in 800.

(*e*) E605, 1 in 10,000.

The sprays were applied by means of a hand continuous atomiser.

Tests with Cabbages.

Green Peach Aphid.—A number of young potted plants (6 to 10) were sprayed with each of the above insecticides.

Examination after 24 hours indicated an extremely good kill with E605, good kills with TEPP and HETP, and unsatisfactory results with the DDT-nicotine-naphthalene compound.

Slaty-Grey Aphid.—Plants carrying a light infestation were sprayed, but the results proved unsatisfactory with all the insecticides at the concentrations set down.

Tests with Celery.

Large plants with extremely heavy populations of green peach aphids were sprayed with the E605 and DDT-nicotine-naphthalene mixtures listed. Poor results only were obtained, possibly due to the difficulty of applying an adequate amount of spray on to the undersides of the leaves by means of a hand atomiser.

The above test was repeated and an additional treatment consisting of E605 plus Agral L was included. In this test particular care was taken, to wet each plant thoroughly and this involved the use of ½-pint of insecticide per large plant—which would normally be considered excessive.

Aphids were eliminated on plants receiving E605 with or without Agral L spreader and the DDT-nicotine-naphthalene compound with Agral L spreader. Satisfactory results were obtained with the DDT-nicotine-naphthalene compound without the spreader, but a few living aphids remained, and it would appear that the inclusion of the Agral L in this instance was definitely advantageous.

Discussion.

In view of the shortage of nicotine sulphate, it is of interest to record that some of the newer type insecticides, and particularly HETP, which is now available, may be used as satisfactory alternatives

Thorough spraying is essential and the inclusion of a spreader such as Agral L is an advantage.

The related phosphate sprays, TEPP and E605 which are not yet commercially available in this State, also appear promising, although consideration must be given to their great toxicity to human beings before any general recommendation for use can be made.

The DDT-nicotine-naphthalene compound was by no means as effective as the phosphate compounds at the dilutions used.

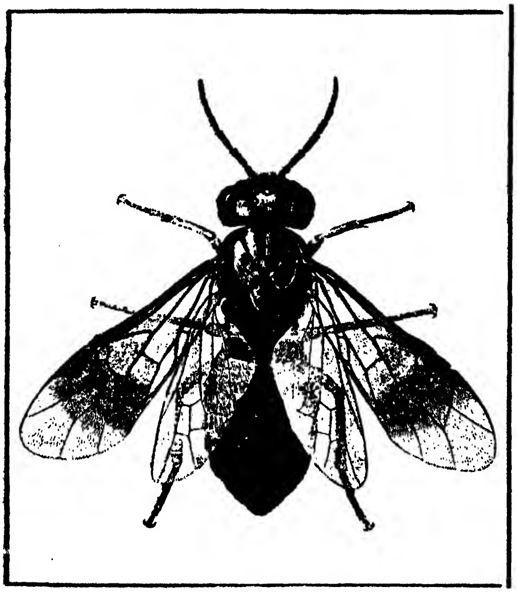
THE USE OF DDT TO CONTROL THE CHERRY SLUG

(*Caliroa limacina*).

N. C. LLOYD, B.Sc.Agr., Entomologist.

WHERE cherry slug occurs it is the usual practice of cherry growers to apply a lead arsenate spray in late November or early December, and this satisfactorily controls this pest.

In view of the efficiency of DDT in solvent naphtha-wetsit emulsion sprays in controlling the cherry aphid (*Myzus cerasi*),



Adult of the Pear and Cherry Slug.

it was decided to carry out a small trial experiment against the cherry slug to determine if a single spray could be used to give effective control against both pests.

In the March district, near Orange, the slug was observed infesting Early Rivers cherries, on 13th December, 1947, and judging by the amount of damage, the pest had then been active for a week or more. The peak period of activity on the trees was reached about mid-December. Towards the end of that month, the pest attacked trees of the St. Margaret variety, and continued to be active on these until nearly the end of January. Some few trees in the block were severely damaged.

Two Early Rivers trees, each infested with the cherry slug were sprayed with the DDT emulsion at a concentration of 0.05 per cent. DDT on 15th December, 1947, and two adjacent trees were left untreated.

Comparative counts of the slugs were made by sampling twenty branches, each bearing numerous leaves, on each tree. The counts are set out in the following table:

Number of Live Slugs on Forty Branches.

Before Spraying	After Spraying			
15/12/47	16/12/47	20/12/47	31/12/47	30/1/48
Treated Trees.				
358	28	1	2	0
Check—Trees Untreated.				
328	305	208	92	1

Cherry Leaf Showing Skeletonising Caused by Larva of Cherry Slug.

(*Continued on page* 546.)

WORM DISEASES IN PIGS.

Methods of Prevention and Control.

(*Continued from page* 453.)

O. M. MACPHERSON, B.V.Sc., Veterinary Research Officer,
Veterinary Research Station, Glenfield.

IN the first portion of this article—which appeared in September issue—the author described how pigs become infested with worms, and discussed preventive and control measures, including piggery design and the use of recommended drugs.

In this month's instalment some of the more important disease-producing worm species are described—life histories, damage caused, principles of control and drug treatment being indicated.

The More Important Disease-Producing Worms of Pigs.

Stomach Worms (Fig. 5, A, B and C.)

Three species of worms commonly infest the stomach of the pig. Two of them, *Physocephalus sexalatus* and *Ascarops strongylina,* are fairly stout, pinkish worms measuring up to about an inch in length. The third, the red stomach worm (*Hyostrongylus rubidus*) is small and fine and thread-like.

Damage Caused.—The worms lie close along the wall of the stomach under a thick, slimy covering and may easily be missed by an untrained observer. A few do not cause much harm, but when the infestation is heavy the wall of the stomach becomes inflamed and thickened. Gastric upsets result, and the pigs lose condition and may die.

Life Histories.—The eggs of the two large stomach worms are passed out in the dung, and must then be eaten by certain types of beetles which feed and breed in pig manure before they hatch and develop to the infective larval stage. The pig becomes infested when it eats the beetles containing the worm larvae. The eggs are very resistant to changes in temperature and can remain alive in the soil for four months or more before being eaten by the beetles. The development to the infective larval stage inside the beetles takes about three weeks.

The red stomach worm does not require an intermediate host. The eggs hatch soon after they are passed out in the dung, and the larvae become infective after living and developing in the soil for about seven days. When the pig swallows the infective larvae in feed or water, they burrow into the lining of the stomach and develop into mature worms in about three weeks. In warm moist conditions the infective larvae can remain alive in the soil for several months, but when exposed to sunlight and dryness, they die within a few days.

Principles of Control.—Destroy the dung beetle by regular removal of manure. Keep the pigs under clean dry conditions and away from damp earthen runs.

Drug Treatment.—

(*a*) Large stomach worms—Carbon bisulphide; sodium fluoride.

(*b*) Red stomach worms—Carbon bisulphide.

The Large Round Worm
(*Ascaris lumbricoides*).
(Figs. 6 and 7.)

The large round worm is the most widespread and difficult to control of all the pig worms.

The mature worms in the small bowel are round, yellowish-white in colour, and may measure anything up to 15 inches in length. The immature worms which migrate through the liver and lungs are too small to be seen by the naked eye.

Life History.—The adult female worms in the small bowel lay thousands of eggs daily, which pass out to the exterior in the dung. The eggs develop to the infective larval stage in about sixteen days or more,

depending on temperature and humidity. They are extremely resistant even to disinfectants and, in moist conditions, can remain alive in the soil for as long as five years. When exposed to constant dryness and strong sunlight, most of them are killed within a few months.

Pigs become infested by swallowing the infective eggs with feed or water, when rooting in soil, or from the contaminated skin of the sow. The eggs hatch in the small bowel and the larval worms burrow into the bowel wall. They are carried in the blood stream to the liver, and from there, after a few days, through the heart to the lungs. When they have reached a certain stage of development in the lungs, they migrate up the wind passage into the mouth, are swallowed and pass back to the bowel. Here they slowly increase in size and grow from very minute worms to full egg-laying maturity in about two months. The complete internal life cycle from the time the eggs hatch in the bowel to the time the worm starts laying eggs takes sixty days or more.

Damage Caused.—Lightly-infested pigs may appear healthy, but fail to put on as much weight per pound of feed as they would if they were worm-free. Unless the danger is realised the eggs gradually accumulate in the piggery until they are present in sufficient numbers to cause serious damage.

Pens and runs contaminated with round worm eggs are particularly dangerous to young pigs. In suckers and weaners pneumonia is a common result of round worm infestation. If death does not occur, the destruction of liver and lung tissues by the immature worms may still be so severe that the pig never completely recovers. Frequently the period during which the immature worms are damaging the liver and lungs coincides with weaning when the resistance of the pig is generally lowered. The result is a permanently stunted pig which fails to make adequate weight gains even if the mature worms are later removed by drugs.

The mature worms also retard the pig. They become tightly packed in the small

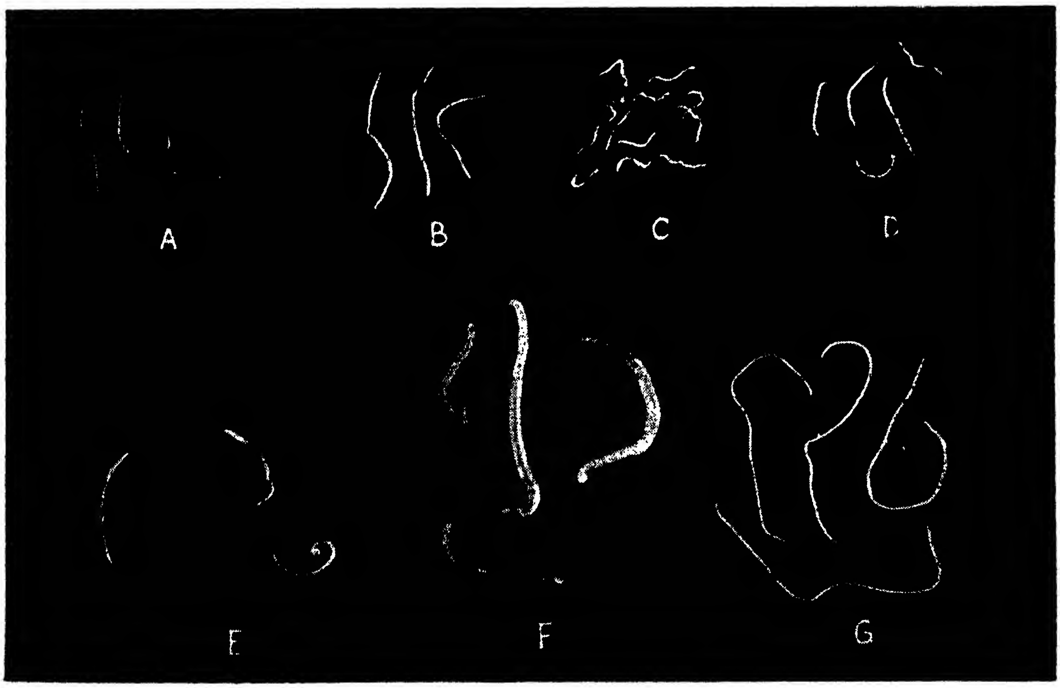


Fig. 5.—Some Common Round Worms which Infest Pigs.

A. & B.—Large stomach worms (*Ascarops strongylina* and *Physocephalus sexalatus*); C.—Red stomach worms (*Hyostrongylus rubidus*); D.—Nodule worms (*Oesophagostomum* spp.); E.—Whipworms (*Trichuris trichuria*); F.—Kidney worms (*Stephanurus dentatus*); G.—Lung worms (*Metastrongylus* spp.).

Natural size. [*Photo: G. A. Hendy.*

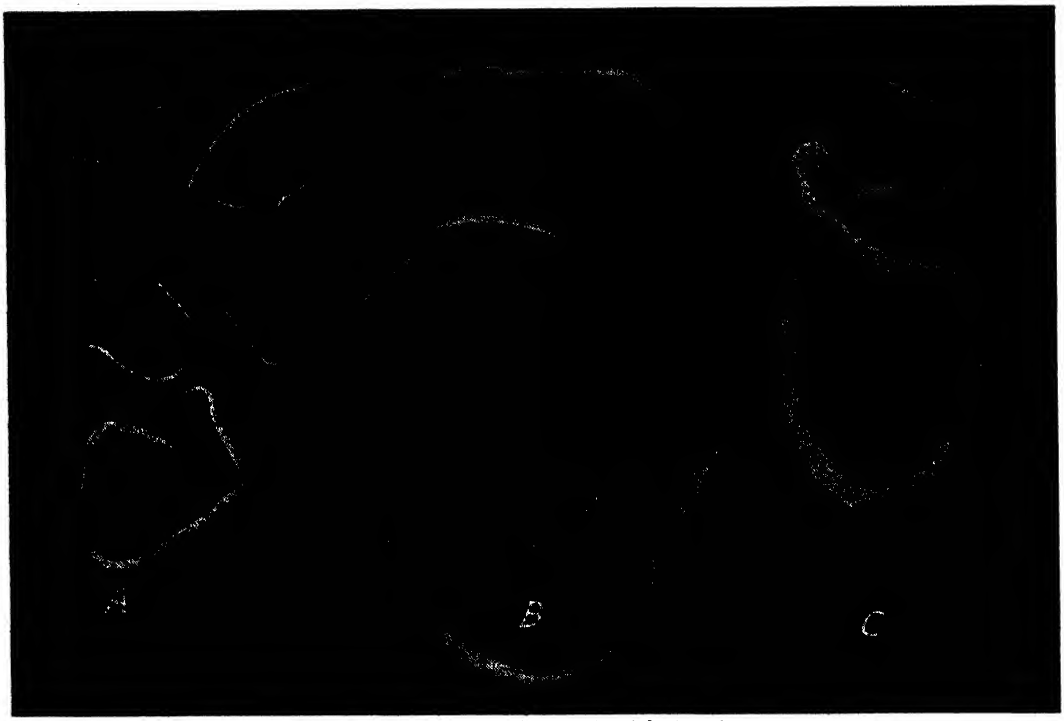


Fig. 6.—The Large Round Worm (*Ascaris lumbricoides*).
A.—Worms at different stages of growth after they have migrated back to the small bowel from the lungs; B.—Mature egg-laying female; C.—Mature male.
Natural size. [*Photo: G. A. Hendy*.

bowel, interfere with digestion, sometimes wander into the stomach and are vomited, block the bile ducts, and excrete poisons which affect the liver and kidneys. Infested pigs, even on good feed, will take two or three months longer to reach baconer weight than uninfested pigs.

After the age of five or six months the symptoms of round worm infestation are not so obvious, but older pigs carrying mature worms will pass thousands of eggs daily which will be picked up by younger and more susceptible pigs.

Principles of Control.—See the section on "Designing the Piggery to Combat Worm Diseases," on page 450 of September issue.

If a piggery is heavily contaminated and clean ground is not available, large round worm disease can only be controlled by rearing the pigs on concrete until they are at least five or six months old. It may be impracticable to concrete the whole piggery at once, and so measures should first be taken to afford as much protection as possible to young pigs. Concrete the farrowing block first and eliminate all earthen runs. Treat the sows twice in the early stages of pregnancy to remove mature worms, and before they are brought into the farrowing pens brush or wash off all mud adhering to the skin. If concrete weaner yards are not available, remove the sow and leave the weaners for as long as possible in the concrete farrowing pens. Later run them in the least contaminated part of the piggery.

Avoid overcrowding and do not run young pigs where older pigs have been. In order to build up clean ground it may be more profitable to carry fewer pigs so that some paddocks can be spelled for several years. Remove all pig manure daily from the pens and do not use it on land where crops for pig feed will be grown.

Treat all pigs at the age of ten to twelve weeks and again two weeks later. Treat young breeding sows twice at about five or six months of age, and all adult stock at least every six months.

Drug Treatment.—Sodium fluoride or Oil of Chenopodium.

(N.B.—Neither of these drugs will remove the immature worms in the liver and lungs.)

The Bowel Thread Worm

(*Strongyloides ransomi*).

These are minute worms less than one-sixth of an inch in length. The parasitic adults, all of which are females, live in the small bowel.

Life History.—The infective larvae actively penetrate the skin or the pig becomes infested by swallowing them. The adult worms in the small bowel lay eggs which hatch within a few hours after they are passed out in the dung. Some larvae develop directly to a stage which is infective to pigs; others develop into male and female worms outside the pig. These worms mate and the females lay eggs which may also develop into infective larvae. Pigs usually become infested as suckers and the infestation persists for some time after weaning.

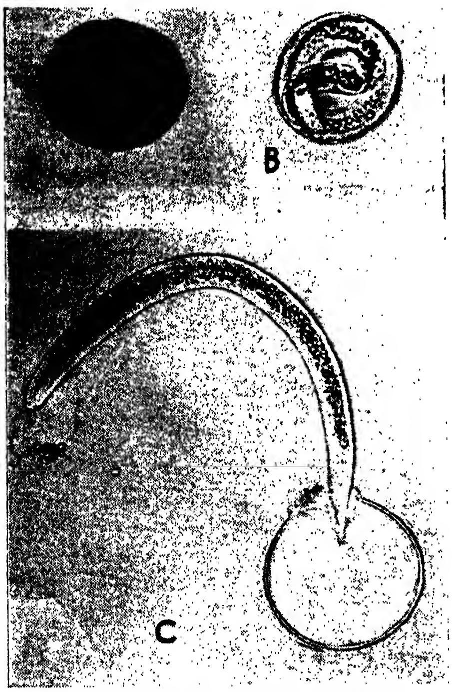


Fig. 7.—How the Pig Becomes Infested with the Large Round Worm.

A.—Worm egg which has just been passed out in the dung; B.—Worm egg about 16 days later which has reached the infective larval stage. C.—Larval worm which emerges from the egg in the small bowel after it has been swallowed by a pig.

Magnification × 350.

[*Photo: G. A. Hendy.*

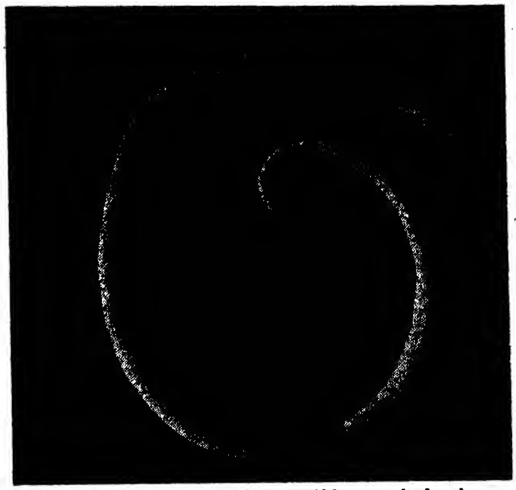


Fig. 8.—The Thorn-headed Worm (*Macracanthorhynchus hirudinaceus*), showing the Head Projection (a) by which the Worm attaches itself to the Bowel Wall.

Natural size.

[*Photo: G. A. Hendy.*

Damage Caused.—Suckers and weaners are most commonly affected. The worms cause scouring and anaemia, and the pigs fail to grow normally. Skin eruptions may be caused by the penetration of the larvae.

Principles of Control.—Keep suckers in clean, dry concrete pens and away from dampness and contaminated soil.

Drug Treatment.—No satisfactory drug treatment is known.

The Thorn-headed Worm

(*Macracanthorhynchus hirudinaceus*).

(Fig. 8.)

The thorn-headed worm is a large white worm which lives in the small bowel. It has a small head projection provided with thorns by which the worm attaches itself firmly to the bowel wall.

Life History.—The adult worms lay eggs which pass out in the dung. These eggs are extremely resistant and may remain alive in the soil for about three years. Before the pig can become infested the eggs must be eaten by certain beetle grubs in which the infective larval stage develops. The pig eats the grub when rooting in the soil.

Damage Caused.—The worms move about and the thorny head projections by which they attach themselves cause multiple injuries to the bowel wall. Sometimes the wall is pierced and the pig dies of peritonitis. The damage to the bowel produces an unthrifty pig.

Principles of Control.—Prevent the pig from rooting in the soil in which the beetle grubs live.

Drug Treatment.—Sodium fluoride may remove some of the worms.

The Nodule Worms
(*Oesophagostomum* species).
(Fig. 5 D.)

These worms are small, stout worms, about half an inch in length, which occur in the large bowel.

Life History.—Pigs become infested by eating infective larvae which pass down into the large bowel. They burrow into the bowel wall and cause the formation of small nodules. Eventually they pass out of the nodules back into the bowel and reach egg-laying maturity after about two months. The eggs, which pass out in the dung, hatch and the larvae develop to the infective stage in about a week. The eggs and larvae are killed by dryness and sunlight, but in moist conditions the infective larvae may remain alive for a year or more.

Damage Caused.—The nodules produced in the bowel wall interfere with its normal functions. Unthriftiness, anaemia, and diarrhoea or constipation are common symptoms.

Principles of Control.—Keep pigs under clean, dry conditions and away from contaminated runs and pastures.

Drug Treatment.—Phenothiazine.

The Whipworm (*Trichuris trichuria*).
(Fig. 5 E.)

Whipworms occur in the blind gut and adjoining parts of the large bowel. They have a characteristic whip-like shape, the anterior portion bearing the head being threadlike and the posterior portion whitish and stout.

Life History.—The infective eggs hatch when they are swallowed by the pig. The larvae grow to egg-laying maturity in the blind gut and large bowel in two to three weeks. The eggs pass out in the dung, and in warm, moist conditions become infective in about eighteen days.

Damage Caused.—Massive infestations in young pigs cause an inflammation of the bowel wall.

Principles of Control.—See section on "Designing the Piggery to Combat Worm Diseases," on page 450 of September issue.

Drug Treatment.—Sodium fluoride may remove some of the worms.

(To be concluded.)

Insect Pests—*continued from page* 541.

Twenty-four hours after treatment there were very few live slugs on the sprayed trees; the majority were wrigging freely on the ground beneath the trees and had lost their slimy coating. Most of the slugs were dead three days after spraying, and from then on, odd live slugs only were seen on the treated trees.

On the unsprayed trees, due to seasonal fluctuation, the numbers of slugs declined towards the end of December and further damage was not great. This drop in population of slugs on the trees is due to the slugs becoming fully-fed and making their way into the soil where they remain until pupation occurs in the following spring.

CONSIDERABLE investigation is being carried out at the Department of Agriculture's Research Station at Glenfield into methods of treatment of mastitis in dairy cattle. A large number of the newer therapeutic substances have been tested, the most satisfactory being entozon, sulphanilamides and penicillin. Penicillin has proved the most valuable form of treatment and gives remarkable results if used early in cases of mastitis due to streptococci. It is less efficient, as are all other treatments, in the case of staphylococcic mastitis.

Poultry Notes.

E. Hadlington, Principal Livestock Officer (Poultry).

GOOD QUALITY EGGS
Are Clean and Cool.

WITH the approach of warmer weather the maintenance of quality of eggs becomes of paramount importance—and everything possible should be done to attain the highest possible standard. We have reached a stage in the development of the industry when producers must become more "quality conscious" if there is to be further expansion, and this applies particularly to country producers who have to contend with higher temperatures than those in coastal districts.

There are two main requirements for the preservation of quality of eggs. These are, (*a*) the eggs must be kept clean; and (*b*) they must be stored under cool conditions.

Keeping Eggs Clean.

Many suggestions have been made in connection with keeping eggs clean but most of these involve the construction of new types of nests or more costly systems of housing, which in the long run may be justified, but at present are difficult to adopt owing to the shortage of necessary materials.

The question then arises as to what can be done now to improve the position.

The first step is to keep the houses reasonably clean and the floors covered all over with a good depth of loose litter. This applies to all types of houses whether intensive, semi-intensive or roosting sheds. The litter should be stirred up occasionally to prevent matting and cleaned out when it becomes damp.

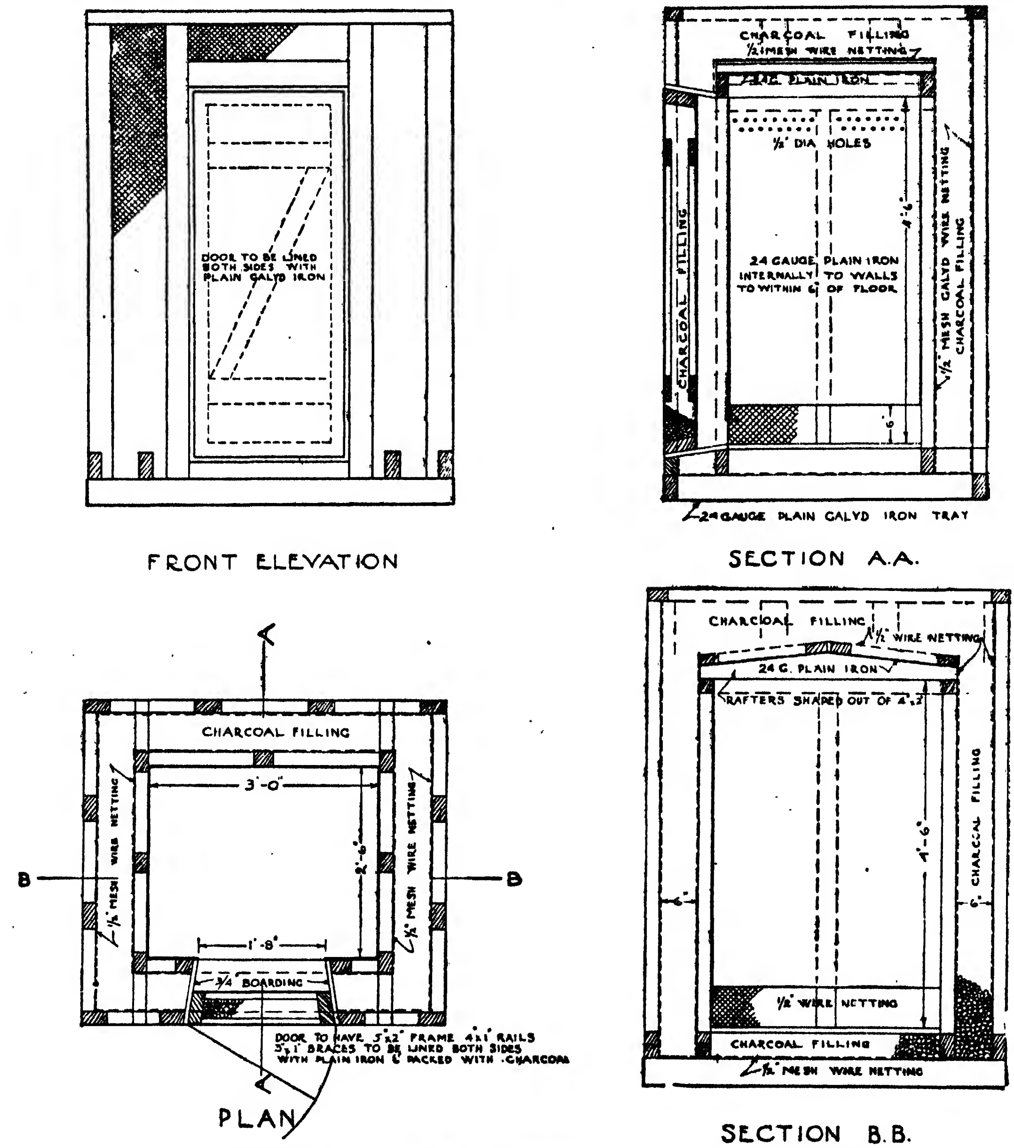
During wet weather it is a decided advantage to close the birds in the houses but this would only be of benefit where the houses are large enough and have plenty of dry litter on the floors.

The next consideration is to use suitable nesting materials and keep the nests clean. It is also important that the nesting material be sufficiently deep to keep the floor of the nests covered at all times—bare nests mean broken eggs and this not only soils other eggs but often leads to the vice of egg eating.

Suitable nesting materials include grit or very coarse sand covered with a good layer of rice hulls, fine straw or softwood shavings, but recent observations indicate that limestone grit by itself may be even more effective in keeping eggs clean.

Clean Egg Competition, particulars of which are given in a leaflet obtainable from the Secretary, Egg Producers' Council, Box 16, P.O., Pyrmont.

In most cases modification or improvements might be effected with advantage.



Diagrams showing Details of Construction of Charcoal Cooler.

Those who have nests which are unsuitable and can obtain the necessary materials to build new ones, may be disposed to try out one or more of the winning designs of nests entered in the Egg Producers' Council

Storing Eggs on the Farm.

The egg rooms on most farms are not sufficiently cool during the heat of the summer to prevent deterioration of eggs kept in them for more than a day or so, and

improved facilities for holdings the eggs are essential to ensure the maintenance of quality both for the home market and for export. Here again, the shortage of materials required to provide suitable storage is an obstacle to the general adoption of a cooling unit. However, where the necessary materials can be secured the erection of a charcoal cooler as illustrated and described on page 548 would provide a suitable cool room for holding the eggs after collecting and while awaiting the carrier to take them to market.

The unit illustrated is a small one for domestic use, and a larger one would be required for storing more than half a dozen cases of eggs and a few buckets full. The size, of course, would be regulated by the number of eggs to be stored. Such a unit if built adjacent to the empty case storage room would be used for holding the packed cases of eggs and the buckets of eggs awaiting packing, the packing being done in the case room, thus obviating the necessity for a larger cooler.

Construction of the Cooler.*

The cooler consists of a chamber within a double framework, the space between the two frames being filled with charcoal held in position by wire-netting. The chamber is lined with plain iron except for the bottom 6 inches, which is lined with netting.

* Particulars supplied by the Architect, Department of Agriculture.

The door should be lined on both sides with plain iron, be packed with charcoal to preserve the insulation, and should fit neatly. The door entrance should taper, and be lined with ¾-inch boarding all round; a wooden floor should be provided to the chamber. The plain iron roof of the chamber shoull be carried on rafters to drain off the water, and a plain iron tray should be fitted underneath.

Such a cooler should be strongly constructed. Suitable material would be, say, 3-inch by 2-inch hardwood; two adjoining sides could be braced diagonally with 3-inch by 1-inch hardwood—though this is not shown in the accompanying diagram. It would be an advantage to paint the framework, before the netting is nailed on, with boiled linseed oil to which enough cement has been added gradually to produce a brushing consistency. This would greatly increase the life of the framework and prevent the staining that would otherwise occur from the wet hardwood.

To operate the cooler it is necessary occasionally to throw a few buckets of water on to the charcoal on top, or fit a spray system which could be turned on as required. This water percolates down through the charcoal insulation, and the air passing through the charcoal is cooled, causing it to flow downwards and into the chamber through the netting at the bottom. As the air gains heat, it rises and passes out through the ventilation holes near the top of the sheet iron sides of the chamber.

THE STANDARD FOR CHINESE LANGSHANS.

FROM time to time requests are received for illustrations and descriptions of the correct type of Chinese Langshans. In order to supply this information concerning this popular breed, the standard, as revised by the Langshan Club of Australia in 1937, is reprinted below, together with illustrations:—

Cock or Cockerel.

HEAD: Skull small and full over the eyes. Beak of medium length, strong, and slightly curved. Eyes large and prominent. Comb single, of medium size, carried straight and erect, showing a good clearance at back of skull, free from side sprigs, of fine texture, evenly serrated, having five or six spikes. Ear lobes small and well rounded. Face must be smooth and free as possible from fine feathers or hairs. Wattles of medium size. The ear-lobes, face and wattles to be also soft and fine in texture.

NECK: Of medium length, moderately fine immediately under back of comb, with a full flowing hackle.

BODY: The back fairly broad, slightly rounded, of medium length, rising with a good sweep to the tail, free from cushion. Breast moderately full and well rounded, not flat; breastbone straight, with level keel. Wings of medium length, closely carried;

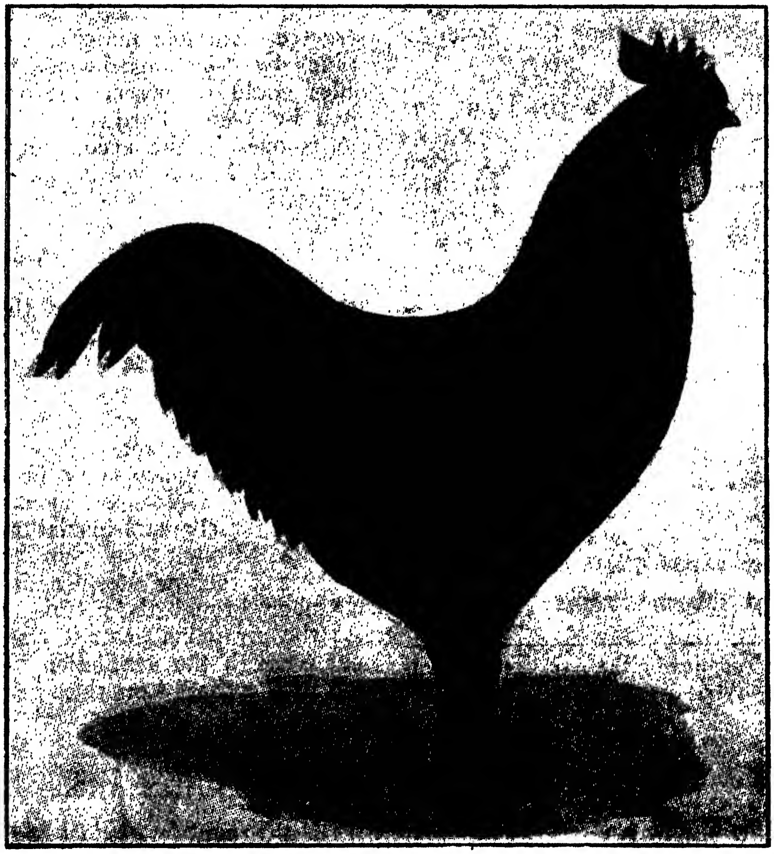
body carriage erect when standing normal; when viewed from side should resemble a shallow V.

TAIL: Of medium size and length, carried gradually up and outwards to an angle of about 35 degrees. Sickle feathers inclined to be pointed. Tail-spread of medium width, fairly close and liberally furnished with side-hangers.

WEIGHT: Cock to range within 6½ to 7½ lb.; Cockerel, 5½ to 6½ lb.

Hen or Pullet.

With the exception of the fluff, which should be rather more in females, the general characteristics of the Australian Chinese Langshan hen or pullet are similar (allowing for the usual sexual differences) to those of the male. The female shape should be free from any squat appearance and be devoid of cushion.



Chinese Langshan Cock.

LEGS: Thighs of medium length, covered with soft, short feathers. Shanks, strong but fine, well rounded, of medium length, standing well apart. Moderately feathered down the outer sides only. Any indication of pigment between the scales is a characteristic of the breed.

FEET: Toes, four, straight, slender and well spread, outer toes only being moderately feathered, with a distinct sign of pigment on the toes and web.

CARRIAGE: Graceful, alert, erect; neat and extremely active.

WEIGHT: Hen to range within 5½ to 6½ lb.; pullet, 4½ to 5 lb.

Characteristic Colours and Plumage.

(Applicable to either sex.)

COLOUR: Beak, light to dark horn. Eyes of a very dark hazel, the darker the better. The comb, face, wattles and ear lobes brilliant red. Legs and feet blue-black, showing a pinkish pigment between the scales. Skin underneath feet to be white, with a

pink tinge, the deeper the pink the better; toenails white.

Plumage: Dense black with a brilliant beetle-green sheen, free from purple barring or blue tinge; feather-webbing of medium texture.

Disqualifications.

Yellow shanks, skin or beak. Five toes, Vulture hocks. Wry or squirrel tail. Side-sprigs.

Chinese Langshan Hen.

Serious Defects.

Being under the respective specified range of weights (penalty: deduct 3 points for each 1 ounce under-weight). Eyes of other colour than hazel. Permanent white in ear lobes. Slate or blue legs in cockerel or pullet. White feathers. Lop comb. Crooked keel bone. Feathers on centre toe (penalty: deduct up to 5 points). In-kneed.

Scale of Points for Judging.

Points to be allotted in proportion to the specimen's varying breed excellence:—

	Pts.
Type and Carriage	30
Head and Comb	20
Richness of Colour; Plumage and Condition	15
Capacity and Fineness of Texture ..	15
Legs and Feet	10
Weight	10
The perfect specimen to score ..	100

APIARY NOTES

AMERICAN FOUL BROOD.*

The Problem in New South Wales.

(*Concluded from page* 489.)

D. L. MORISON, B.V.Sc., Apiary Branch.

THE more beekeepers know of A.F.B. disease the more they will realise the necessity to be constantly on the alert for early indications of infection if heavy losses are to be avoided.

In the first portion of this article—in September Apiary Notes—the author described the life history of the causal organism, the symptoms of the disease and the factors influencing spread, both within the apiary and from one apiary to another.

This concluding section is devoted to the distribution of the disease in this State and a discussion of control measures.

Distribution of the Disease.

American foul brood is present in every main beekeeping State in Australia, with the exception of Queensland. In New South Wales during the last few years outbreaks have occurred in the following main districts:—Tamworth, Coonabarabran, Dubbo, West Maitland, Carcoar, Young, Albury, Gundagai, Nowra, Bombala, Narooma, Tombong, and in various suburban areas of Sydney.

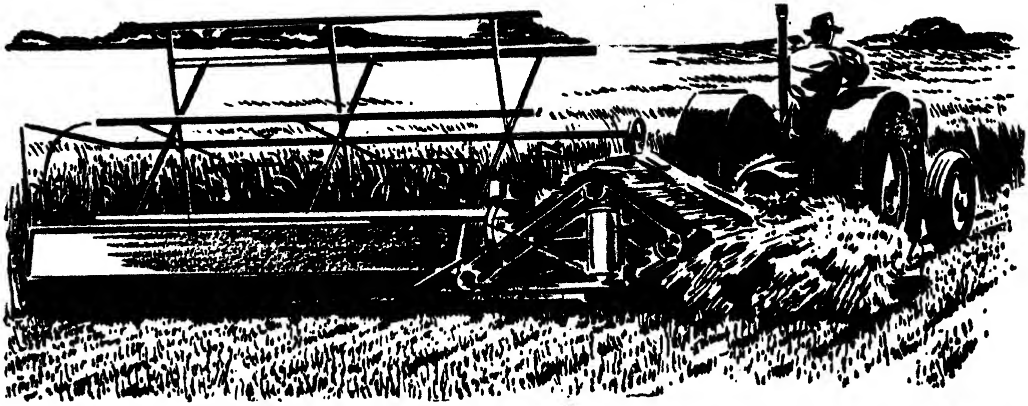
It will thus be seen that the northern parts of the State, including Inverell and the North Coast, are free of the disease, whereas the southern part is subject to periodic outbreaks. In the South Coast and highland districts of the State the disease tends to persist indefinitely. In these areas it has been found in bee trees and these constitute a natural reservoir of the disease. Owing to the presence of these diseased colonies which cannot be adequately controlled and a degree of residual or latent infection due to the spores in known infected apiaries, the eradication of American foul brood from these areas is a practical impossibility. It is therefore necessary for every beekeeper to become familiar with the symptoms of the disease and to know what course of action to take should he discover infection in his colonies.

The Human Element as a Factor in Control.

Those who adopt the attitude that "it won't happen," or who are prepared to take American foul brood lightly, may find to their sorrow that it can be a most persistent and costly disease. Some beekeepers neglect to carry out inspections of the brood in their apiaries in a systematic manner, and even when foul brood has been detected in some apiaries adequate action has not been taken to prevent its spread.

If, upon first noticing infection, which may only be in a few colonies, a beekeeper thoroughly checks all brood nests and burns any colonies showing symptoms, it is quite possible that the disease may be eradicated. If, however, the beekeeper does not recognise the disease, is not sufficiently thorough in his inspections, does not care, or is too busy to carry out adequate inspections, the disease will spread through the apiary. Once combs have been taken from infected colonies and placed in other hives, the control of the disease is enormously complicated. These spore-carrying combs may be present in a hive for a considerable period before the spores are fed to bee larvae and symptoms become apparent, with the result that a few diseased colonies are continually cropping up. Such a beekeeper ultimately has to burn a certain percentage of colonies

* A previous article on this subject appeared in the May, 1945 issue of *The Agricultural Gazette*. However, in view of the widespread interest in the subject, a more comprehensive description of the foul brood position has now been prepared.



annually, and, in an apiary where this has occurred, it may take many years of close inspections to render the apiary relatively free of the disease.

Inspections for American foul brood must be carried out in a very thorough and systematic way to avoid all possibility of missing colonies showing symptoms. The work must not be done in conjunction with other operations. If a beekeeper carries out inspection of the brood in conjunction with, for example, extracting, accidents are liable to occur and the disease to persist in the apiary.

Some persons are physically incapable of carrying out the necessary inspections. Older men particularly may be in this class, especially if their eyesight is failing, since they cannot then detect symptoms of the disease. The Department's Inspectors carry out quite a number of inspections of apiaries when an outbreak of foul brood occurs. However, the necessary check inspections must often be carried out by the beekeeper himself. Once a beekeeper has been given tuition in foul brood diagnosis and control, he must watch any colonies which have been in contact with the disease. It is not possible for Departmental Inspectors to carry out thorough routine checks on apiaries.

A beekeeper must notify the Department of Agriculture as soon as he suspects that his apiary is diseased. If in doubt as to the nature of any condition affecting the brood of his bees, he should forward a sample to the Department, where a diagnosis will be made. It is known that some beekeepers have concealed the fact that their bees have become infected with American foul brood and have carried out control measures entirely on their own initiative. This is a contravention of the Apiaries Act. If any organised campaign is to be made against the disease, it is necessary that the Department know which apiaries are affected and where.

> *The only real answer to A.F.B. is vigilance and that is true whether sulpha or burning is the method of treatment.*—C. M. Isaacson, in "Gleanings in Bee Culture."

American foul brood may easily be spread intentionally by a beekeeper should he desire to. It is unfortunate that cases of malicious infection with American foul brood have occurred in New South Wales. Any beekeeper who maliciously infects another beekeeper's colonies is liable to prosecution and deserves severe censure by his fellow beekeepers.

The disease is not transmissible to humans. If it were, some beekeepers would be less likely to have it about the place.

Control of the Disease.

The course of action to be taken to control American foul brood depends on circumstances to a large extent. In order to formulate proper control measures beekeepers should contact the Department of Agriculture and give a full history of the particular case.

Where a few colonies in an apiary are infected the usual procedure is to burn them together with their contents. The affected colonies should be left until nightfall, the bees killed either with cyanogas or petrol, and the hives burnt and the ashes buried. It is usually cheap "insurance" to do this, since the first loss is often the last loss.

However, when many colonies are affected and the hive material is good, the saving of bodies is permitted provided that they are boiled for half an hour in 1 per cent. caustic soda solution.

The treatment of bees by transferring them to foundation is not recommended, nor is it allowed unless the number of colonies affected is large and the beekeeper is a reliable man capable of carrying out check inspections of the transferred bee brood thoroughly and periodically, so that any recurrence of the disease may be detected and dealt with. If this work is left in the hands of a careless person, re-infection usually results and ultimately the entire apiary must be destroyed. Transferring bees to foundation is a risky procedure owing to the fact that the disease may recur perhaps two or three years later, owing to residual spore contamination.

Much has been said in recent years about A.F.B.-resistant strains of bees, and the use of various sulpha drugs, notably sulphathiazole. However, such measures have only minimised or temporarily arrested the disease. Their wholesale use would probably result in the creation of "carrier" colonies and the more widespread distribution of the disease.

There does not appear to be any short cut to rendering an apiary entirely free of the disease. This can only be achieved by periodic and thorough inspection of all brood nests and the elimination of infected colonies as soon as symptoms become apparent.

It is never wise to attempt to save combs from a colony affected with foul brood. The combs should either be burnt or rendered down for the wax, which, if properly processed, is quite safe to use in the manufacture of comb foundation. No outbreaks of American foul brood have been found which could be attributed to this cause.

The disinfection of combs with solutions such as alcohol formalin and alcohol soap formalin has not proved to be a practical procedure owing to the time involved and the possibility of recurrences of the disease.

Requirements of Apiaries Act.

To enable an organised campaign to be carried out against this disease, certain legislative powers are vested in the Department of Agriculture by the Apiaries (Amendment) Act.

Sections 4 and 5 of this Act are as follows:—

"4. No beekeeper shall:

(*a*) Keep or allow to remain upon any land occupied by him any bees, bee-combs, hives, or appliances known by him to be infected by or liable to spread disease, without immediately taking the prescribed steps to cure or eradicate the disease; or

(*b*) Sell, barter, give away, or otherwise than in the prescribed manner dispose of any bees or appliances from an apiary known by him to be infected by or liable to spread disease.

5. Every beekeeper in whose apiary any disease appears shall, immediately after first becoming aware of its presence, send written notice thereof to the Minister for Agriculture or to an inspector."

Regulation 4 of the Apiaries Act prescribes:—

"4. The steps which shall be taken by a beekeeper to cure and eradicate disease under section 4 of the Act shall be as follows:—

(*a*) Where a hive is infected with American Foul Brood (*Bacillus larvae*)—

(i) the bees in the hive shall be destroyed or, with the approval of an inspector, transferred to clean non-infectious hives in which the comb foundation only is contained in the frames;

(ii) all frames and combs from the hive and any other materials in contact with the disease, if not of sound construction, shall be removed and burned in a hole in the ground and all burned debris shall be well covered with earth. Materials of sound construction need not be destroyed but shall be immersed in boiling water for not less than thirty minutes."

Cases have come under notice recently of persons representing themselves to be Apiary Inspectors when, in fact, they were not. Any person who doubts the bona-fides of a person who wishes to inspect his bees, should ask for the Inspector's authority, signed by the Minister for Agriculture. Inspectors appointed under the Act include officers of the Apiary Branch of the Department of Agriculture and certain police officers, and these have been provided with such an authority.

Other States of the Commonwealth have legislation affecting New South Wales beekeepers. Both Queensland and Western Australia require that a certificate of health accompany bees and honey being imported into their respective States.

However, legislation is only the foundation on which an effective programme may be constructed. Before such a programme can be put to good effect it must have the energetic co-operation of beekeepers.

TEMPERATURE plays an important part in the occurrence of bacterial defects in milk and cream. It is possible during the cooler weather of winter to get away temporarily with methods of cleansing that would not be practicable in the warmer months, but such methods are short-sighted. Many farmers, in consequence, find themselves with a legacy of "ropy" cream in early spring.

Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Guernseys)	46
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	30
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ..	121
Hawkesbury Agricultural College, Richmond (Jerseys)...	107
Hicks Bros., "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., "Nundi," Tarcutta (Red Poll)... ...	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	49
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	103
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabee," Quirindi...	75
Salway, A. E., Cobargo (Stud Jerseys)	57
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Von Nida, F. E., Wildes Meadow...	30
Wagga Experiment Farm, Wagga (Jerseys)	69
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	23
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm...	89
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	50
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale ...	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Mt. Penang Training School, Gosford	34
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	69
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief of Division of Animal Industry.

Herd Recording Fees.

HERD Recording fees charged under the Department of Agriculture's Herd Production Improvement Scheme are to be raised from 4d. to 6d. per cow for each test, as from 1st October, 1948.

Commenting on the necessity for this increase, Mr. G. McGillivray, Chief of the Department's Division of Dairying, said that when the fees had been fixed originally at 4d. per cow per month, it had been anticipated that the return from each cow would be 3s. for each lactation based on an average of nine tests during the period. It had been found, however, that cows average only slightly more than six tests with a return of approximately 2s. per cow. This was not sufficient to cover the owners' proportion of the costs.

Mr. McGillivray pointed out that both the Commonwealth and State Governments contributed one-third each towards the expenses of the Scheme, and that payment of a fee of 6d. per cow per month by the owners would result in the desired return of 3s. per cow being realised.

In recent years the herd recording year had ended on 30th September and membership under the Scheme had been maintained on that basis. In future, however, the herd recording year would close on 30th June, each year.

THE loss caused by depreciation of hay in unthatched stacks is very considerable and every effort should be taken to see that hay conserved this spring does not suffer spoilage from this cause. The main essential in thatching is an ample supply of good, hard, clean straw of suitable length, showing a minimum of flag. Varieties with a short, weak straw should be avoided. Straw showing forced or rank growth is not ideal, as it lacks strength and lasting ability and invariably carries an undue amount of flag. Length is a very desirable feature, as the longer the straw the more weatherproof will be the thatch, while the work of building the thatch is much easier and less pegs are required to hold the straw securely in position.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. O. "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B. Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Settings of Eggs Successfully Flown to U.S.A.

Excellent Hatchings Reported.

AUSTRALORP and Chinese Langshan setting eggs flown from New South Wales to the Iowa State College of Agriculture, Ames, United States of America, have given an excellent hatching of chickens. A communication from Iowa State College advises that out of a batch of 100 Australorp eggs, ninety-one strong chickens were successfully hatched, while eighty chickens were hatched from a batch of 100 Chinese Langshans.

During the recent visit abroad by the Rural Bank-sponsored Progressive Farmer Team, Mr. W. H. Bruce, a member of the team, called at the Iowa State College, and while there was asked to endeavour to arrange a supply of Australorp and Chinese Langshan hatching eggs.

Arrangements were accordingly made by the Department with Mr. N. F. Judson of Thornleigh to supply 100 Australorp eggs, and with Mr. R. D. Wilson of St. Ives to supply 100 Chinese Langshans—the Rural Bank of New South Wales attending to financial and various other details of the transaction. Special care was taken in packing the eggs to ensure their safe transit during the three-day flight from Australia to the United States.

The results obtained would be regarded as highly satisfactory even from eggs hatched on the farm in New South Wales; from eggs which were transported such a long distance by air, they must be regarded as exceptionally good.—E. HADLINGTON, Principal Livestock Officer (Poultry).

THE green sprouting of seed potatoes prior to planting should be of particular interest to coastal growers, as this practice promotes early emergence and more rapid early growth of both foliage and tubers. Green sprouting also enables the young sprouts better to withstand attack by soil-inhabiting diseases such as rhizoctonia.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.)	120	13/11/48
Bradley, H. F., "Nardoo, Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm	297	9/6/49
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	74	2/2/49
Limond Bros., Morisset (Ayrshires)	66	15/7/49
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	49	8/5/49
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys)	94	27/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	21/7/49
Scott, A. W., "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F.. Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	67	26/4/49
Yanco Experiment Farm (Jerseys)	91	14/10/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle	51	20/4/49
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Burns, R., "Wilga Glen," Coonamble	20	24/12/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell	33	28/7/49
Coventry Home, Armidale	11	29/9/48
Daley, A. E., "Siton," Oakwood Rd., Inverell	14	14/5/49
Daley, A. J., Lea.ands, Inverell	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell	34	5/4/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	141	23/4/49
Fairbridge Farm School, Molong	33	9/4/49
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	27/7/49
Frizelle, W. J., Rosentein Dairy, Inverell	111	9/9/48
Genge, G. L., Euston, Armidale	36	22/9/48
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood	24	10/5/49
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	34	22/9/48
Ince, W. G., Kirkwood St., Armidale	11	12/4/49
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	34	22/9/48
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	17/6/49
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	40	20/11/48
McCosker, E., "Bannockburn Station," Inverell	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood	31	13/8/49
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
McMillan, N., Duval Road, Armidale	30	29/9/48
MacNamara, B. "Mount View," Cessnock	67	21/5/49
Marist Bros. College, Campbelltown	82	23/1/49
Mason, A., Killarney, Armidale	33	30/9/48
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Mullholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	28	15/12/49
Police Boys Club, Kurrajong	12	5/7/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
Rolfe, A. E., "Avon Dale," Inverell	22	14/5/49
Rowlands, F. C., "Werribee," Waugoola	35	23/8/49
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	8	12/7/49
St. John's Hostel, Armidale	6	24/6/49
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills	29	11/6/49

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boys' Home, Westmead ...	30	9/7/49
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	54	5/4/49
Tanner, F. S., Dural Rd., Armidale	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale ...	33	30/9/48
Tombs, P. C., Kellys Plains, Armidale ...	49	29/9/48
Tombs, R., Harlwood, Armidale	40	22/9/48
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48
Von Frankenberg, F. E. "Spring Hills," Camden	68	12/12/48
Waddell, W., "Afton," Oakwood Rd., Inverell	127	5/7/49
Waters, A., Marsh Street, Armidale	2	13/10/48
Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., "Birida," Armidale ...	39	12/4/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

A Simple and Humane Method of Killing Table Poultry.

WHEN table poultry are to be killed it is advisable to fast the birds for eighteen to twenty-four hours beforehand, but water may be given during the first twelve hours, as this will assist in cleaning the digestive tract and prevent shrinkage. Fasting also improves the flesh and renders the process of cleaning more hygienic.

The easiest and cleanest method for the poultry farmer to adopt is to dislocate the neck of the bird—quite a simple operation after a little practice, and one which does not cause any suffering.

The procedure is to hold the bird by the legs, with the left hand, head downward, in front of the left leg of the operator. Then raise the bird and grasp the head with the right hand, the neck being in the fork of the thumb and first finger, and the remaining fingers around under the beak and throat. In this position the breast of the bird will be facing the ground, and the body stretched across the front of the operator's legs.

The head of the bird is now bent backwards, and with a sharp downward pressure the neck is easily dislocated. After the neck is broken, pressure should be continued until the head is separated from the neck, so as to sever the jugular vein, but without breaking the skin. The blood then accumulates in the neck cavity and the head is not removed until the bird is being eviscerated. When killing young birds with tender skin it is necessary to exercise care to avoid pulling the head right off.—E. HADLINGTON, Principal Livestock Officer.

WASTE of feed represents a little-considered but substantial economic loss in Australian animal industry. Neglect to conserve surplus pasture growth is, of all forms of waste, perhaps the most serious and the least recognised, but even feed which the farmer has gone to the trouble of growing is frequently not used to the best effect, points out the Division of Dairying.

Too many dairy farmers put in a lot of time growing crops such as sorghum and maize from which they derive only a fraction of the crop's potential feeding value. They prepare the land well, manure it, and are continually cleaning the growing crop. Then when they decide to feed it, they cut it and throw it out in the paddock, where a large percentage is wasted. The animals usually eat the flag and soft portions of the stalk and leave the rest. After a month or so the farmer rakes up the residue and burns it. This is sheer waste of effort and good fodder. If these crops were fed as chaff, better results would be obtained and waste avoided.

Editorial—

A New Stock Disease

Safeguard Against Its Spread.

THE hazards of inadequate supervision of artificial insemination are emphasised by a recent announcement that a new disease of cattle (Trichomoniasis) has been diagnosed for the first time in New South Wales.

This new disease, which occurs in most countries of the world, is due to an infection of the breeding organs. It is spread mainly by infected bulls at time of service, and is characterised by early abortion, usually accompanied by a diffuse purulent discharge, and in some cases by failure of affected animals to breed.

Inexpert, careless or unscruplous use of artificial insemination methods could effect a wide spread of this disease, as with many other diseases, in a very short time. And Trichomoniasis is another of those diseases which strikes at the very basis of our livestock industries—the breeding process.

More than carefulness and honesty is essential to safe practice of artificial insemination. Skilled technical guidance and supervision are necessary. Here again this new disease serves to illustrate that point.

Trichomoniasis, for instance, is difficult to diagnose, depending upon microscopic examination of the discharge shortly after abortion. The organism, moreover, is very fragile and is not easily found in preserved material.

Diagnosis, certainly, is a job beyond the capabilities of stock owners. How then, if artificial insemination were uncontrolled, could stockowners obtain any guarantee from those practising this method of breeding that adequate safeguards had been taken to prevent spread of infection?

The outbreak of this disease emphasises the wisdom behind the Stock (Artificial Insemination) Act, 1948, the main aims of which are to ensure that only healthy bulls are used at insemination centres and that artificial insemination is practised only by competent persons.

Incidentally, this new disease (Trichomoniasis) is scheduled under the Stock Disease Act, which means that it is compulsory for stockowners to report its presence to a district stock inspector.

Difficulty of diagnosis makes it all the more necessary to watch cattle carefully for signs such as early abortion and other symptoms mentioned above.

CLOVERS FOR MILK AND MEAT ON THE SOUTHERN TABLELAND.

W. D. HARDY, B.Sc.Agr., H.D.A.*

THE lack of good pasturage during the winter time is the limiting factor in stock production on the Southern Tableland. The pastures are sadly lacking in legumes which are so important in providing proteins and vitamins necessary for good milk production, successful lamb raising, and are also so valuable in building up the standard of soil fertility.

Great success has been achieved in pasture improvement on some properties in this area. It is the purpose of this article to describe the ways in which clovers can be used for this purpose.

The natural pastures of the Southern Tableland are composed mainly of grasses such as Wallaby or White Top (*Danthonia* spp.) which provide both winter and summer grazing, Kangaroo grass (*Themeda australis*), Spear grasses (*Stipa* spp.), Wire grass (*Aristida* sp.), Tussocky Poa (*Poa caespitosa*), and Wheat grass (*Agropyron scabrum*).

The Pastures Lack Legumes.

These pastures are sadly lacking in legumes, except where topdressing with superphosphate is practised. Consequently their feeding value is relatively low, and they provide a ration which is unpalatable, innutritious and unbalanced—being a "one-sided" ration of carbohydrates or starches.

Southern Tablelands pastures thus suffer a "protein drought" practically all the year around, which does not ensure economic feeding of the available fodder, since the greatest benefit from any foodstuff is obtained when the ration provided is balanced.

Poorly balanced pastures, particularly in the winter time, have three big disadvantages, namely (*a*) they cause a lowering of milk production in the milk zone and butter producing areas; (*b*) they do not provide good conditions for lambing ewes, a point of significance when the rigorous nature of the winters experienced is considered; and (*c*) they cause lowering of soil fertility with consequent erosion.

The lack of good pasturage during the winter time is the limiting factor in stock production of this area.

Better Pastures Can Provide an Economic Ration.

The need to provide an economic ration from better pastures is greater at present because of the lack of supplies of suitable concentrates, and there is also a need to help offset the acute dollar position and to supply increased food for Britain.

The shortage of concentrates can be overcome most efficiently and at the lowest cost by encouraging the growth of legumes (clovers and medics), by sowing seed of leguminous species and grasses suitable for the locality and by paying greater attention to farm management methods.

With the commencement of the construction of a country-killing centre at Goulburn, it has become more important than ever that the farmers and graziers of the Southern Tableland pay greater attention to pasture improvement and management, if the killing centre is to be a success. It has been shown, notably in New Zealand and the Argentine,

Grazing Subterranean Clover at Crookwell.

* Mr. Hardy was, until recently a District Agronomist with this Department and was in charge of the Southern Tableland Area.

that such a centre can be an outstanding success, provided adequate supplies of the best quality stock are available all the year around. Quality and continuity of supply are the hallmarks of success, but these can only be achieved by the improvement of pastures and the raising of soil fertility.

Value of Farmyard Manure.

During shortages of fertilisers, the great value of farmyard manure will be emphasised to the Australian farmer. In the past not enough time and attention have been paid to the benefits to be derived from the liberal use of farmyard manure. Farmyard manure has been regarded too frequently as a waste product; it has been left lying in "pats" on the paddocks, while many a farmer has deemed it a great service if some market gardener or horticulturist has "cleaned" his paddocks by removing the "unsightly" manure pats. In other cases, great heaps of manure are left lying in the vicinity of cow bails or stables where it forms an excellent harbour for flies and weeds.

Making Hay of Perennial Rye Grass, Subterranean Clover and White Clover at Burradoo, Moss Vale District.

Clovers Provide Proteins and Vitamins.

Clovers are important pasture constituents on account of their high protein and vitamin content and nutritive ratio. They can be used in many ways, such as for grazing, soiling (*i.e.*, cut and fed green to animals), or they can be converted into hay or excellent silage provided a little extra care and attention is taken in the ensiling process.

Clovers being rich in protein, vitamins, calcium and phosphorus are especially valuable for milking cows, stock rearing young, young growing animals, pigs, etc. The mineral elements ensure good bone development in young growing stock, whilst the proteins build up other tissues, flesh, etc., in the body.

Good Farm Management is Needed.

Legumes require for their best growth a readily available supply of phosphorus—supplied in the form of superphosphate.

Features which it is desired to emphasise here are those aspects of farm management, such as the better use of farmyard manure, controlled grazing of pastures, and the prevention of soil erosion so as to conserve soil moisture and soil fertility.

Farmyard manure, apart from adding organic matter or humus to the soil, contains the valuable fertilising elements phosphorus, potassium, nitrogen and calcium. Phosphorus and calcium are required by clovers for their best development; therefore any method whereby farmyard manure is incorporated in the soil will increase and improve clover growth. The valuable fertilising properties of farmyard manure are illustrated by the rank tufts of pasture growth produced from a manure "pat." This rank growth is brought about by a concentration of fertilising elements in the one spot. Stock prefer a shorter growth to this rank herbage and furthermore the palatability and nutritive qualities of the remainder of the herbage would be improved by breaking up and evenly distributing animal droppings by the frequent use of pasture harrows.

Apart from the fertilising value of farmyard manure, where stock have been grazing on a clover area, it often contains, in a viable condition, large quantities of clover seed which can be incorporated by pasture harrowing it into a grass-dominant sward, thus forming a better balanced pasture.

White clover is readily established from cow droppings, and now it is becoming a common practice on the Southern Tableland to spread Subterranean clover by passing the seed through cattle. The method is to graze a large number of cattle for a few days on a well-established Subterranean clover stand, after it has seeded profusely and subsequently dried off, and then turn the cattle into the paddock where it is desired to establish the clover. The paddock is then top-dressed in the autumn with about 1 cwt. superphosphate per acre. This method is giving excellent results.

Influence of Grazing Methods on Clover Population.

Controlled grazing, including both under- and over-grazing of pastures, is an important consideration in conserving the clover population.

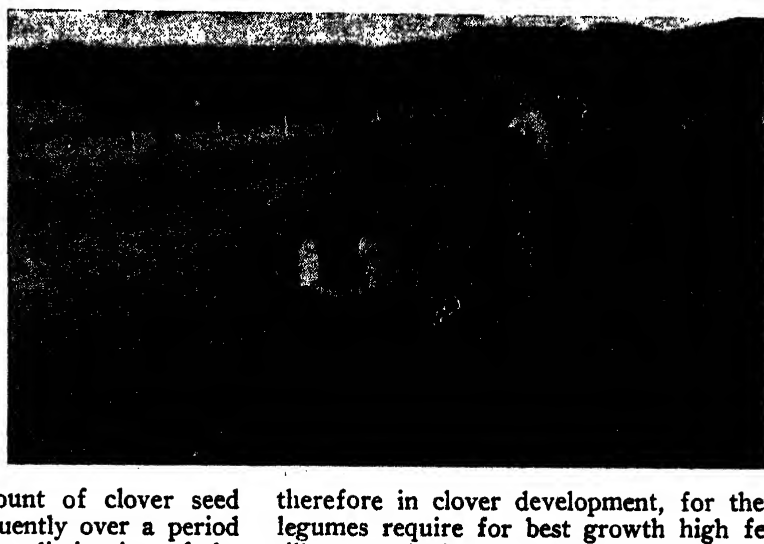
Overgrazing (especially where superphosphate is not used in adequate quantities) a pasture, particularly at seeding time, reduces the amount of clover seed that is set, and consequently over a period of years will result in a diminution of the clover content. A pasture composed of 60 to 70 per cent. of grasses and 30 to 40 per cent. clover or medic is the ideal to aim at from a grazing point of view.

Under-grazing a pasture, *i.e.*, allowing the sward to reach the hay stage for a number of years in succession, will also result in a diminution of the number of leguminous plants in a sward.

A system of grazing must be aimed at which will allow the grasses and clovers to grow satisfactorily together, will allow of maximum production both from the quantity and quality points of view, and at the same time ensure that the clovers seed freely. Grazing a pasture when 2-3 inches high by sheep and 4 inches to 5 inches by cattle would be good practice. Close continuous grazing of a pasture prevents the leaves from manufacturing sufficient food for the plant, consequently root starvation occurs and the plant either loses much of its vitality or dies. By spelling a paddock for a time, thus allowing food manufacture to go on in the leaves followed by the translocation of this food to the roots, the plant is maintained in a healthy, highly productive condition.

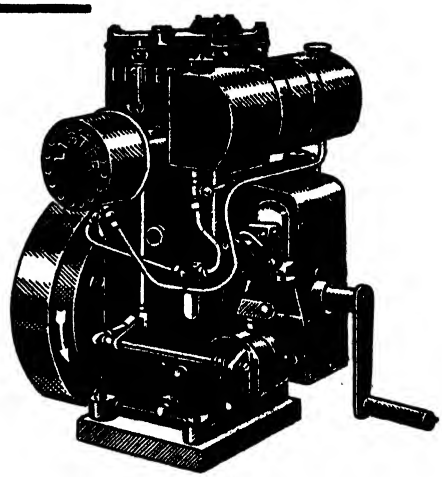
Soil Erosion Control is Important.

Methods adopted for the control of soil erosion are largely responsible for maintaining soil fertility and increasing the efficiency of rainfall. They are important therefore in clover development, for these legumes require for best growth high fertility, particularly adequate amounts of readily available mineral elements such as phosphorus and calcium, as well as a plentiful supply of moisture.



A Pasture of *Phalaris tuberosa*, Subterranean Clover and White Clover at Robertson.

(*Continued on page* 583.)



LARGE AREA PASTURES

Under Irrigation

By the Contour System.

F. AUTRY HALL, H.D.A., District Agronomist.

DURING recent years the lay-out used almost universally for large areas for irrigated pasture in the Benerembah and Wah Wah Irrigation districts and the Mirool Irrigation Area has been the "contour system" though it is sometimes referred to as the "contour terrace system." The great advantage of this method when compared with the more orthodox "check-bank" or "border" system, is that a minimum of labour is required during watering, one man being able to water 500 to 700 acres (after check-banks have consolidated), whereas 50 to 60 acres under the old check-bank system is considered a maximum for one man to water; the result is that the new system is more economical to maintain.

The contour system also lends itself more readily to the cultivation and harvesting of crops, provided the land is not too steep. Watering can become almost entirely a daylight job, provided that substantial banks are erected, no harm being done should more water than is necessary be put in one bay during the night. If more water than is necessary is put in one bay under the contour system it merely builds up a "head" and is drained into the next bay which will water more rapidly as a result. On the other hand, the older system requires regular attention throughout the night as well as the day, if great water wastage is to be avoided and the time taken to water the pasture is to be kept within reasonable limits, as in this case the surplus is drained away.

The main points of difference in the two systems are the lay-out of the check-banks for the control of the water and the method of applying the water. Under the check-bank system the banks are formed to run up and down the slope, watering being done by means of a continuous flow down the slope. In the contour system, banks are erected across the slope, with a fall of 3 or 4 inches between them, the water being confined between the banks until a complete cover is obtained, when the surplus is drained immediately into the next lower bay.

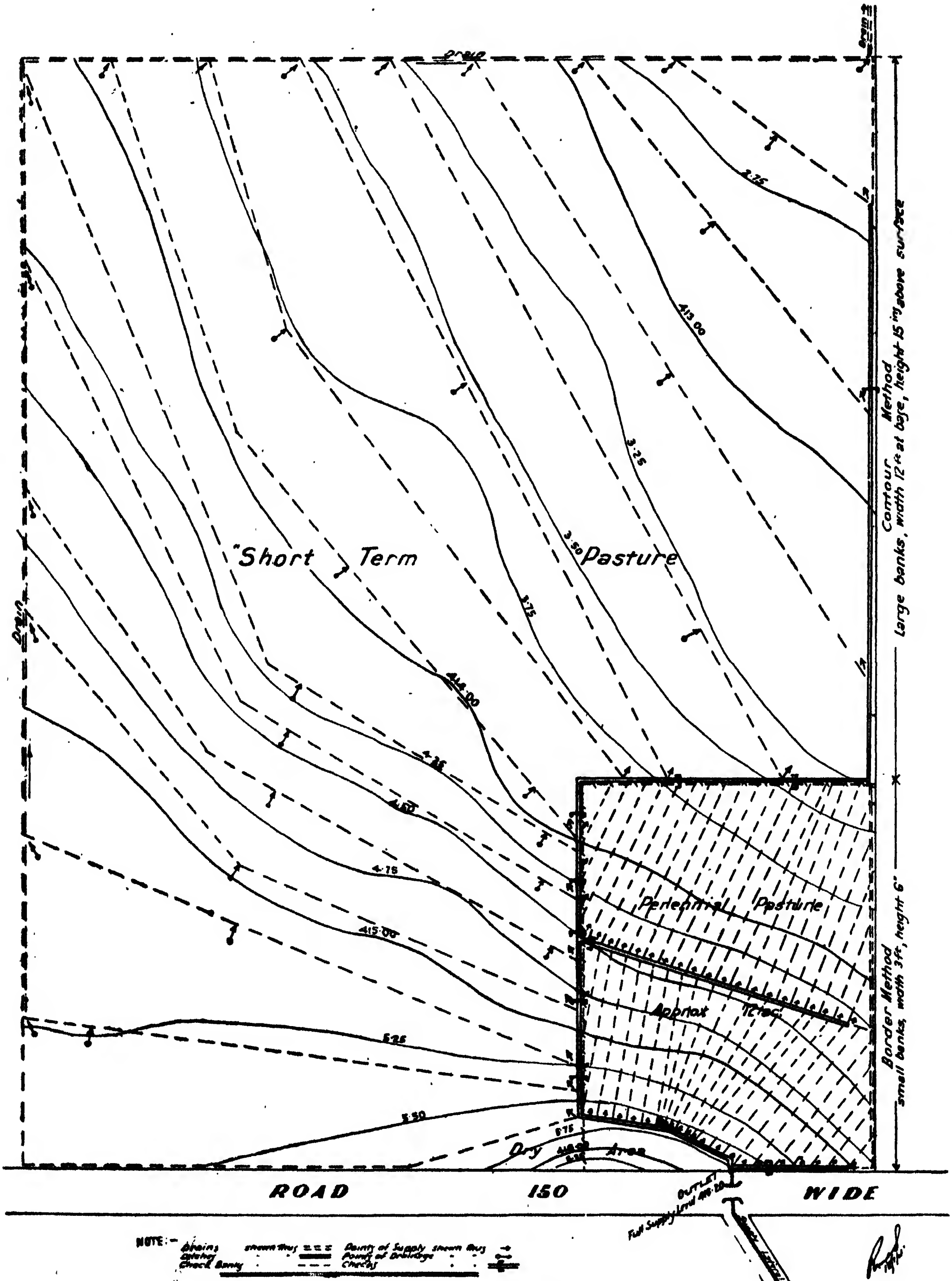
The Check-bank or Border System.

To use the check-bank or border system, small banks 2 to 4 inches high and 1 to 2 feet across at the base, are formed with a crowder, grader or grader-ditcher, running with a fall of ¼ to 1 chain apart, depending on the type of country and the amount of slope on the land. On steep land the banks require to be close together in order that adequate control of water may be obtained. Water is allowed to run into several bays at once from a head ditch, and is controlled by the small check-banks running down the slope.

Surplus water is then taken away in a drainage ditch at the lower end of the bays. This surplus water is thus wasted, as it is usually hot, and if re-used will "scald" succeeding bays, as water never gains any depth and heats quickly under this system. It is seldom wise to use runs more than 5 chains in length, as pasture is usually scalded out at the lower end of the long bays owing to the heating of the water.

The Contour System.

In the case of the contour system, the banks are erected across the slope, closely following every 3- or 4-inch contour line, with the result that they are seldom straight, but any one bank is on the same level at any point and at either end. The distance apart of banks will depend upon the amount of fall on the land. Where land is steep, the banks will be close together, while on almost flat land, if a fall of 3 to 4 inches were maintained, they would be a considerable distance apart, so that adequate water control is difficult—the difficulty is experienced in the draining of such wide flat bays and not in the application of the water. In such cases the contour should be split, so that the banks are never more than 5 chains



Design for Pasture Irrigation.

The small area of perennial pastures is watered by the check bank or border system, and the remainder by one series of bays set out on the contour system.

apart; the fall between the banks may be 2 inches or even less.

It is essential that substantial banks be erected, at least 15 inches above surface level. In order to obtain this height the bank will require to be approximately 12 feet across at the base (bottom of the delver furrow). When constructing such a bank, it is necessary to strike out with the plough 9 to 10 feet apart without disturbing the surface between the furrows upon which the bank is built. Such a bank will not require further attention for many years, as sufficient height has been allowed for consolidation and the levelling effect of stock tramping. It has been proved that the additional height built into the bank at its original construction, is much cheaper than the topping up annually required by smaller banks.

It will be found necessary to use a large delver and road plough for this work. A suitable delver will have a 12-foot wing and a 14-foot landslide; such a delver is also necessary for the ditching required for pasture irrigation.

Suitable Delver Ditch.
Note height of ditch bank about 15 inches.
The pasture is Wimmera rye mixture—first year.

A Scooped Supply Ditch.
This type is recommended because of its shallow depth and broad shoulders. Such a ditch requires a minimum of maintenance.

Suitable for Watering Treeless Plains Soils.

In the Wakool Irrigation District a large proportion of the irrigable land is flat, treeless and of a very even surface, and the soil, from an irrigator's point of view, is poor. In consequence the expected return yield is low and the contour system is recommended as a means of reducing the cost of development and production.

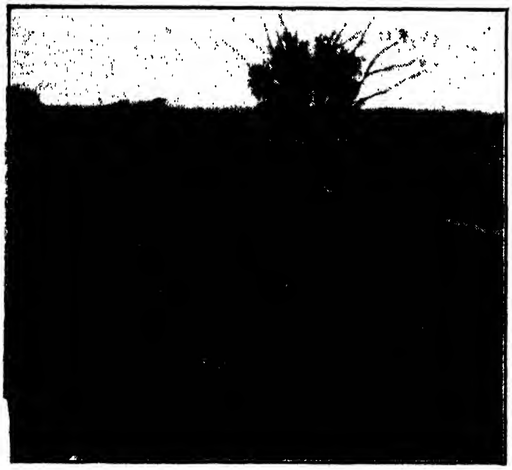
Owing to the peculiar structure of these soils it is considered that best results will be obtained by minimum working and preservation of the thin top-soil layer in its original position, as only this top soil will provide a favourable seed bed for pasture plants. It is therefore recommended that the land be lightly worked with a scarifier

(not ploughed), then sown and contour banked without grading.

As the country is very flat the banks will be required on a much reduced contour—in places down as fine as ½ inch—in order that the width of the bays be kept to 4 to 5 chains.

It is expected that the system on this country will have two advantages over the border system, other than cheapness of layout and working:

1.—Pasture will establish more readily due to the seed being sown in the favourable surface soil rather than the saline subsoil, as is the case with the border system where the banks are usually formed by grading the surface soil.



Delver Ditch with Banks Spread, leaving a "Bone" in the Centre.
With such a ditch it is possible to cultivate the bottom to clean the ditch.

2.—A more satisfactory penetration will be obtained and water can be held in the bay for this purpose an extra few hours without loss if necessary.

The very poor permeability of these soils is one of the factors limiting production under present methods.

Importance of Drainage.

It is essential that each bay be provided with individual direct drainage, i.e., a small check should be present in order to drain the delver furrow on the lower side of the bay directly into the drainage ditch. Many areas contour-watered show the usual swamp weed growth in the lower bays through the practice of draining each bay entirely into the next bay below, a practice which will ruin the pasture within a short period and which can be prevented by provision of drainage to each bay as described above.

The Cost of Preparation.

The cost of preparing land for pasture under the contour system varies with the type of country; whether grading is necessary, and if so to what extent (steep country does not require as much grading as flat, owing to its good natural drainage); the type of pasture to be sown (*i.e.,* whether the plants are tolerant to periods of submergence or otherwise); and the contour of the land, which will influence the number of contour banks necessary for any given distance. On very steep land the system becomes uneconomical, due to the cost of erecting the great number of banks required and the correspondingly large area of waste land covered by the banks.

In comparison with the check-bank system the cost of preparing similar country is in favour of the contour system, which usually runs out from 10s. to £1 per acre cheaper. Land is usually prepared for contour watering ready for sowing for a cost of 35s. where grading is unnecessary and the contour is such that the banks will average approximately 3 chains apart.

This figure comprises: 6s. per acre (survey fee—this will vary with the area to be surveyed); 5s. per chain (erection of the banks); 10s. per chain (ditching); and the cost of working the land.

The cheapest way of preparing the land is first to ascertain the area commanded by water, and to plough, grade and sow before the actual contour surveying is undertaken. When the surveyor is at work the position of the banks can be marked by means of a single furrow plough, and the banks later erected over the plough furrow. By this method the working of the land is done as one large area, and is correspondingly cheaper than if a number of irregularly-shaped, small areas have to be worked, as is the case where the banks are erected before the land is prepared. Also if the surveying is undertaken before preparation it will be necessary to measure the position of the banks from the surveyor's plan, often resulting in a major mistake which may later result in the impossibility of watering certain sections of the land.

The Ditches Required.

A head ditch is constructed along the high side of the paddock, and down the slope across one end of each series of bays, so that every bay of a series may be watered independently from the supply. A drainage ditch is constructed across the opposite end of each series of bays to the supply, so that each bay may be drained separately. That is, the area is divided, if necessary, into series of conveniently sized bays by the running of supply and drainage ditches alongside one another down the slope from the head ditch at convenient divisional points.

Openings to the drainage ditches should be permanently open, except when the actual watering is being carried out, otherwise damage will be done to the pasture during wet weather by the accumulation of water in the bays, with the resultant waterlogging of the soil and scalding of the pasture. It is usually found convenient to erect subdivisional fences on the banks of these supply or drainage ditches so that stock may be completely shut off from any series of bays while water is being applied.

A Rice Crop Grown on the Contour System.
Sown pasture will follow the rice.

Size of Individual Bays.

The supply ditch should have sufficient capacity to take the maximum supply from the "Dethridge wheel," or wheels available.

Size of the individual bays is limited by quantity of water available and the type of pasture to be sown. For example, lucerne should be watered in 8 hours or less, and should drain at least as quickly, otherwise "scalding" will result in hot weather; pasture consisting mainly of hardy annual plants such as Wimmera rye grass and Subterranean clover, to which no mid-summer watering is given, is safely watered in 24 hours, with a further 24 hours for draining.

Thus, if 12 acre-feet of water is available per day (24 hours), lucerne should be sown in bays not greater than 6 acres in area, giving 8 inches absorption of 4 inches per acre; the remaining 4 acre-inches are applied to the bay in order to build up sufficient "head" to cover the high side of the bay, which is 3 or 4 inches higher than the low side, depending on the contour being used.

With the same supply an 18-acre bay of Wimmera rye grass and Subterranean clover can be watered with safety.

How to Use the System.

Water is applied to the highest bay of a series from the head ditch, the total supply being turned into one bay, until the watering of that particular bay is complete. It is important, when using this system, that the full supply be used on one bay at a time, and the watering of each bay completed before the next is commenced. Quick watering, to be immediately followed by rapid drainage is the secret of successful irrigation management under any system.

When a complete cover of the first bay is obtained, the supply is shut off from the top bay at the head ditch, and is diverted round to the end ditch, from which an opening is made into the next highest bay. At the same time the bulk of the surplus water from the top bay is drained into the second or next highest bay by cutting the dividing bank in one or more places.

Thus the second bay will fill much quicker than the first, as both the supply from the ditch and the drainage water from the first

bay are being applied. For this reason, if convenient, the first bay of a series may be made considerably smaller than the second and succeeding bays.

If 12-acre feet of water is supplied per day and is sufficient to water the first bay of 6 acres in 8 hours, the supply, plus the drainage from the first bay, will water a second bay of 9 acres in 8 hours, allowing for some loss during the final draining of the first bay; 6 to 7 acre-feet (depending on whether a 3- or a 4-inch watering is given) are available for the second bay in 8 hours, provided that no loss of water is sustained. The object is to drain this surplus water off as quickly as possible.

When the bulk of the water has been drained in this way, an opening is made into the drainage ditch at the opposite end of the bay to the supply, and the delver furrow at the base of the check-bank will carry any remaining water into the drainage system.

When the second bay is filled, the process is repeated on the third bay, and so on until the lowest bay of the series has been watered. Thus the only waste water of any quantity is the surplus from the lowest bay, which is minimised if this bay is smaller than the higher ones; in fact, the size can be calculated so that the last bay will completely water with the drainage water from the bay immediately above.

A Minor Contour Survey is Essential.

It is essential that all land to be irrigated be contour surveyed by a surveyor with a knowledge of agricultural hydraulics, in order that the land and channel capacities be correctly designed for the purpose intended.

The Possibility of Seepage.

A note of warning must be given to those settlers intending to use very light sandy soils for irrigation purposes. Such soils require very careful watering with very small bays, in order that more definite water control may be exercised, so that the danger of seepage and the resultant salted condition of the land can be avoided. On such soils it is advisable to sow pastures that will give as complete a cover of the land as soon as possible, in order to minimise the evaporation from the surface of the soil.

It is assumed in this article that a "safe" soil (one not liable to water damage) is to be used. Should the irrigation of an "unsafe" soil be contemplated the layout of the pasture may be done on the contour system, but the system would require to be considerably modified from that set out herein. The main modification necessary would be in respect to the time of watering and subsequent draining of the land. In order to reduce this it would be necessary to reduce the size of the bays to half or even less.

On "safe" country, using a "safe" pasture (annual plants), the bays may be as great as 40 acres in extent, provided that the water supply is sufficient to fill the bay within the times stated.

Cropping the Land before Pasture.

It has become a common practice in the Griffith district to prepare the land for the contour system during the winter and spring for the sowing of pastures or lucerne during the approaching autumn, and to utilise the land during the summer by the growing of a catch crop such as Japanese millet. This practice is considered sound, as it has the effect of cleaning the land for the pasture. When Japanese millet is used, ample time is available to graze the crop and work the land ready for the sowing of pasture during March or April.

Should the land be virgin country, it should be graded before sowing the summer crop, which will consolidate the land. A further grading before the sowing of the pastures may be considered necessary. Land previously crop-irrigated is considered best for pasture, provided that it is clean and in "good heart," as it is smoother and better consolidated.

(To be concluded.)

CASTRATION of male pigs is as important on farms where pigs are raised for market as it is on stud farms. It enables the farmer to control breeding operations at his piggery without hindrance and has many advantages related to production of pork and bacon—the castrated animal yielding a carcase with flesh of a much finer grain and quality and free from sexual flavours and odours.

Bacon curers prefer the barrow pig (boars castrated while young) to sow pigs for the manufacture of the best quality bacon.

CONTROL OF MILK FEVER

E. J. McBARRON, Stock Inspector, Albury.

MILK FEVER is a common disease of dairy cattle, characterised by a state of collapse and coma. It is caused by temporary deficiency of one or more chemical elements in the blood stream and is associated with a general upset of mineral balance at calving. Left without treatment most animals affected with milk fever would die. The earlier treatment is adopted the better the response.

The name commonly used for this disease is not a satisfactory one; it is a misnomer because there is no rise of temperature as seen with true fever.

Occurrence.

The disease is commonest in cattle about seven years old and even older and exceptional in heifers on their first calf. Well-bred, high-producing cows are specially susceptible, and form the largest proportion of cases. The majority of cases occur within 48 hours after calving, but cases are recorded up to 5 days after calving. Odd cases occur at other times, *e.g.*, before a delayed calving and up to 6 weeks afterwards.

There is evidence to show that some cows have a special susceptibility, and develop the trouble at successive calvings. Again the disease occurs as an "epidemic" or series within a herd, a phenomenon shown by other non-contagious diseases such as red-water (Haemoglobinuria)—not to be confused with "red-water," the common name for tick fever.

Symptoms.

Like other diseases, milk fever can exhibit typical and atypical forms; the commonest form only is described in this article.

At first the cow appears depressed and disinterested in anything nearby—even in her calf. She ceases to ruminate and the appetite is noticeably diminished or suspended. The nose becomes dry, the breathing slower and the udder softens. Later the animal exhibits staggering gait and "paddling." It often happens that she is yarded for milking at this time and goes down in the bail. The milk yield is low or absent.

From this stage there is a rapid progression, within an hour. The animal lies down, becomes sleepy, and can only be urged to rise with difficulty; the loins appear to be weak, the back hollows, and when standing, groups of muscles of the limbs show tremors.

A period of excitement may intervene, but the next stage—which may develop within an hour of first onset of any symptoms whatever—is the one most commonly seen. The animal is down, sitting on the brisket, the head bent round to the chest, the muzzle near the udder (Fig. 1.). At times, the head, which seems too heavy for the neck to carry, is straightened and supported temporarily with a pronounced kink (Fig. 2). These positions are quite typical of milk fever. There may be a grinding of the jaws, copious discharge of saliva and light snoring (paralysis of the throat). Touching the eye-ball with the finger produces no flicker, nor pinching the skin over the ribs.

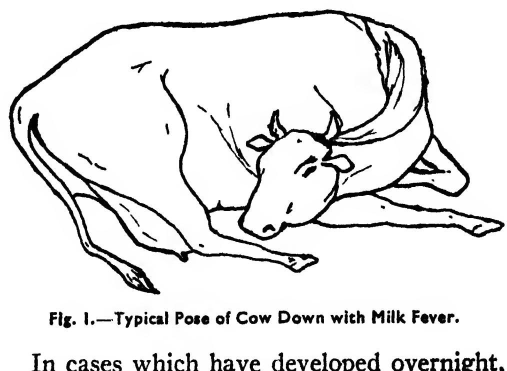


Fig. 1.—Typical Pose of Cow Down with Milk Fever.

In cases which have developed overnight, or left untreated for several hours, the animal may be lying on the side and be unable to move the head or retain a resting position on the brisket, i.e., the animal is "flat out." The breathing is heavy, laboured and slow, the eye is dull and the animal appears to be in a coma. It is in this stage

that treatment is often unsatisfactory or prolonged, and if the condition is of any duration, complications will occur, *e.g.*, pneumonia (after a night's exposure in cold weather), bloating and blockage of urine.

Conditions which may be Confused with Milk Fever.

Conditions similar to milk fever include:

Septic Womb (Endometritis).—Rarely seen within three days of calving. A common result if animal did not "clean" properly—*i.e.*, did not expel the foetal membranes or "water-bag." Associated with a swelling of the lips of, and offensive discharge from, the vulva. The train of symptoms differs from that of milk fever in that it does not generally progress beyond the paddling movements, staggering and apparent weakness in the loins and there is usually a high temperature.

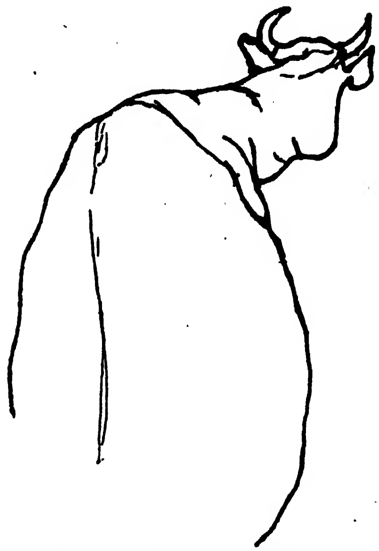


Fig. 2.—Pronounced Neck Kink Typical of Milk Fever. Shown when the cow attempts to lift the head.

Grass Tetany.—This condition occurs up to eight weeks after calving and in some forms is so like milk fever that professional opinion is required to differentiate it. Usually the animal is grazing on very rich lush pasture, *e.g.*, on oat crop, clover or improved pasture paddock where the growth is in the young stage. The limbs are rigid instead of slack as in milk fever, and pinching the skin or other methods of producing pain will give some response. This disease is seasonal.

Acetonaemia.—A chronic condition which extends over days, or even weeks and which may occur up to some months after calving. Diagnosis of this condition is rather specialised, and it generally involves several members of the herd. In many respects it is similar to what dairymen call "impaction." Although it may occur soon after calving its symptoms are distinct from milk fever.

After Calving Paralysis.—This is brought on by injuries to nerves and structures concerned with the act of calving. It is a common result where manual assistance has been necessary, or calving has lasted for hours. The expression and demeanour of the cow are bright, with none of the depression and collapse and coma of milk fever. The appetite is generally not affected, and any of the milk fever treatments show little or no improvement.

Cause and Course.

The most generally accepted cause of milk fever is an acute temporary deficiency in the blood of the mineral calcium and possibly other chemical elements. Calcium forms a large proportion of the bones, but the body is unable to convert sufficient of it into an active form for its immediate requirements.

Left without treatment most cows affected with milk fever would die. Complications soon develop if the animal is lying prone on the ground, and the value of early treatment is stressed.

Prevention.

In known susceptible animals the injection of calcium borogluconate solution (see later under treatment) in half doses immediately after calving and, again 12 to 24 hours afterwards will often ward off an attack. Measures such as the reduction of concentrates, *e.g.*, grains and meals, in the week prior to calving, have not given satisfactory results.

TREATMENT.

Two procedures are now standard and widely practised, viz,— (1) Udder inflation with air, and (2) the injection of a soluble compound of calcium either directly into the blood or under the skin.

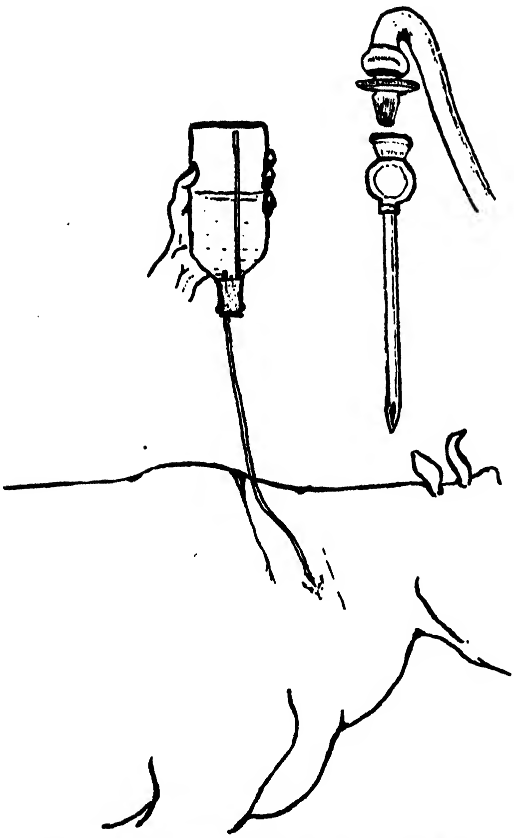


Fig. 3.—Method of Injecting Calcium Boro-gluconate by Gravity Feed Bottle.
Also detail of attachment of tube to needle.

Udder Inflation.

This method is quite effective. It requires a teat siphon, bicycle pump and preferably an air strainer; the equipment may be bought packed in convenient cases. The procedure is as follows:—

Boil the siphon for 5 minutes, and cleanse the end of the teat thoroughly with a piece of cotton wool soaked in methylated spirit. Pick up the siphon by the bulb, insert into the teat canal, and holding in position with thumb and fingers, commence pumping until the quarter is of moderately firm consistency. Then treat remaining quarters in a similar manner. If the end of the teat is flipped with the thumb and forefinger it should obviate the necessity of tying.

Response to this treatment is slower than with the injection method. Should recovery or marked improvement not occur within six to eight hours the inflation should be repeated. The objections to the method are that the air remains in the udder for days after treatment and that unless strict cleanliness is observed, there is a great danger of introducing infection. The cow should not be milked out until recovery is complete or preferably six hours afterwards in order to avoid relapses.

It is necessary to combine certain after treatment with the udder inflation method and this is described later.

Injection of Calcium Boro-gluconate.

Direct injection into a vein should not be attempted by a layman for it requires skill and experience and is attended by some danger. When injected under the skin there is little danger.

Materials required are: —

1. A 20 cc. syringe and two hypodermic needles of 16-19 standard wire gauge, each at least two inches long, *or* a gravity feed bottle complete with rubber tubing, as shown in Figure 3.

2. An enamel funnel, cotton wool, breakfast cup, methylated spirit and saucepan or other suitable container to boil the solution.

All equipment used should preferably be boiled, or for emergency use, thoroughly scalded in near boiling water.

3. Calcium boro-gluconate, which can be purchased in powder form, either in packets or canisters, or in sterile solutions in bottles ready for use. The solution may also be prepared as follows: Calcium gluconate

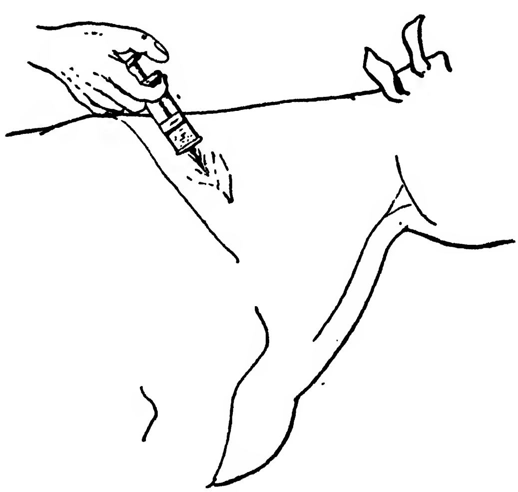


Fig. 4.—Method of Injecting by Means of Syringe.

powder 2 oz. and boracic acid powder 3 drachms are added to ½ pint (10 oz. or 300 cc.) of water in a saucepan and boiled for at least three minutes until the solution becomes clear. It is often difficult to avoid a slight cloudiness with some samples of powder. It is advisable to strain the solution through a funnel containing cotton wool into a bottle or suitable container as some commercial samples of powder may contain dust and gritty particles. The utensils should have been boiled or scalded by placing in boiling water.

Site of Injection.—On either side of the neck under the loose skin clear of the shoulder bone. Wipe the area vigorously against the hair with cotton wool well soaked in methylated spirit, at least twice.

Method of Injection.

(a) *Gravity Feed Bottle* (Fig. 3).—Insert needle under skin; invert the bottle holding rubber tube at its tip and allow a small quantity to flow until the tube is filled. Have an assistant hold the bottle whilst the tube is attached to the needle. Inject half of solution in two places—on either side of the neck. Administration is aided by moving the needle within the blister formed.

This equipment can be constructed from a vaccine bottle with rubber cork, short lengths of glass tubing, and 3 feet of rubber tubing of 4 millimetres bore.

(b) *Syringe.*—The plunger is removed from the barrel of the syringe and together with needles, placed in cold water and brought to the boil. In cases of emergency the syringe and needles may be sterilised by holding in boiling water, but this method is not desirable.

Insert one needle under the skin and use the other to charge the syringe with the solution from a breakfast cup. Detach syringe and attach the needle inserted under the skin and discharge (Fig. 4). Repeat this operation until half of the solution has been used up. The return of solution through the needle may be avoided by shifting it in the blister raised after each 20 cc. injection. Withdraw the needle and proceed to inject remainder in the opposite side of the neck. Gently massage blisters in order to hasten absorption.

After-Treatment.

Within an hour the animal should become brighter. If flat out on the ground she may be pulled on to her brisket and propped up with a log, fence post or bundle of straw. The legs should be folded under in the position normally adopted by a cow in the act of rising.

Provide a bucket of water for drinking and assist if necessary. This may be important since the cow may not have had a drink for some hours, and water is required to assist the action of the concentrated solutions injected into the body.

Bloating is often a complication due to the eating of succulent feed before the attack, and impairment of the normal expulsion of gases associated with digestion. The left flank is usually distended. Do not attempt to drench this condition; relief may be given by kneading and massaging the flank with the fist or knee for a few minutes until part of the gas is expelled by mouth. Only in very rare cases is "tapping" the paunch necessary.

If the animal is brighter and the breathing has changed from being heavy, heaving and labouring to being even in rhythm, and the eye-ball has become sensitive to the touch, an attempt should be made to force the cow to rise by means of a whip lash or dog bite. If unsuccessful, the dose of calcium boro-gluconate should be repeated in two hours.

After the animal has regained her feet, do not milk out straightway but ease the udder after at least 6 hours, or allow the calf to suckle only for a short period.

In general, the earlier treatment is adopted the better is the response. Where the animal has been flat out on the ground for hours or overnight, complications develop.

If two or more injections are given with little improvement, professional aid is necessary.

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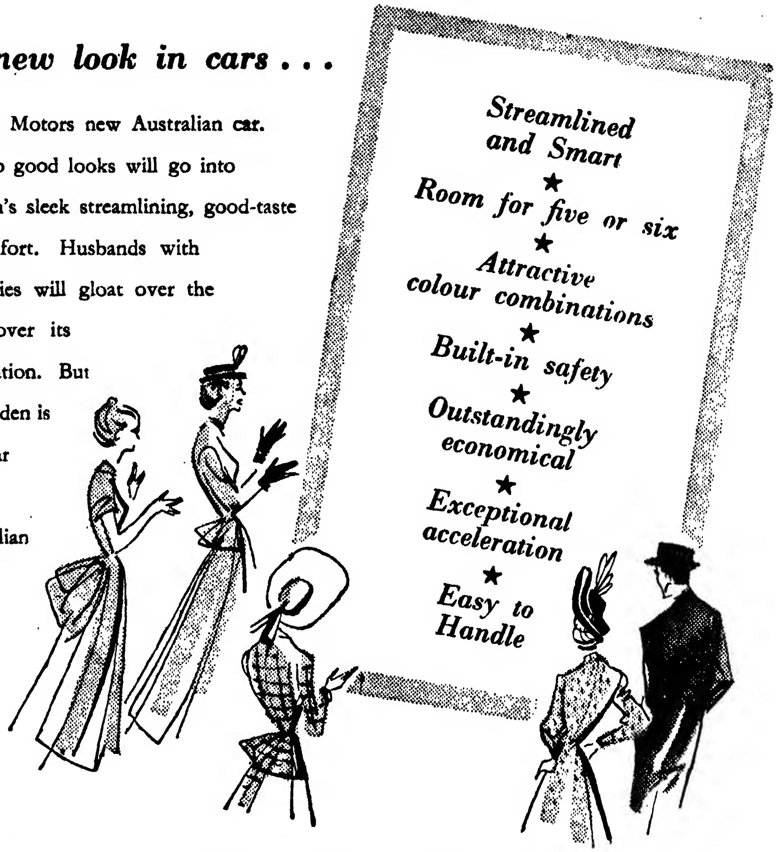

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WORM DISEASES IN PIGS.

Methods of Prevention and Control.

(*Concluded from page* 546.)

O. M. MACPHERSON, B.V.Sc., Veterinary Research Officer, Veterinary Research Station, Glenfield.

THIS is the third instalment of this article, previous portions having appeared in September and October issues. In it the author describes yet other species of worms that infest pigs, supplies a reference table of round worms and discusses methods of computing and measuring drugs.

Lung Worms (*Metastrongylus* species): (Fig. 5, G.).

These are long, slender whitish worms, about half to three inches in length. They are found in the fine branches of the air passages in the lungs.

Life History.—The female worms in the lungs lay eggs which are coughed up into the mouth, swallowed into the food passage and eliminated in the dung. Earthworms which feed on soil contaminated with pig manure eat the eggs, which develop to the infective larval stage inside them. The pig eats the earthworms when rooting in the soil. The lungworm larvae are set free when the earthworm is digested in the pig's stomach. They penetrate the wall of the small bowel and are carried through the heart to the lungs where they grow to egg-laying maturity in about four weeks after being swallowed by the pig.

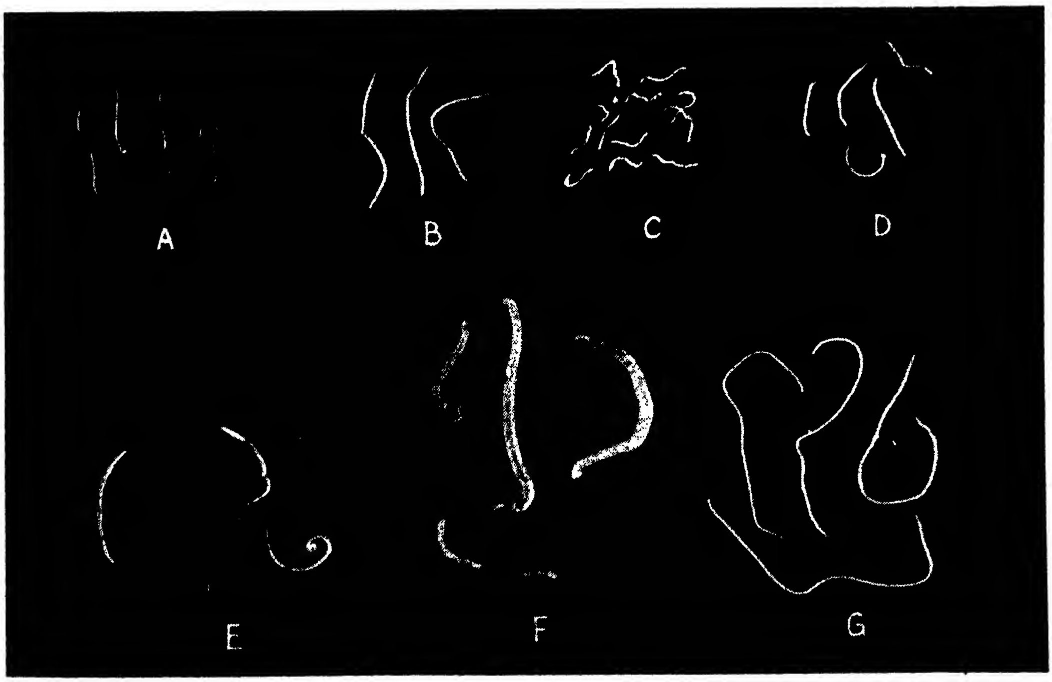


Fig. 5.—Some Common Round Worms which Infest Pigs.

A. & B.—Large stomach worms (*Ascarops strongylina* and *Physocephalus sexalatus*); C.—Red stomach worm (*Hyostrongylus rubidus*); D.—Nodule worms (*Oesophagostomum* spp.); E.—Whipworms (*Trichuris trichuria*); F.—Kidney worm (*Stephanurus dentatus*); G.—Lung worms (*Metastrongylus* spp.).

Natural size. [*Photo: G. A. Hendy.*

Damage Caused.—Heavy infestations in young pigs cause bronchitis and pneumonia.

Principles of Control.—Keep young pigs under dry conditions. Prevent them from rooting for earthworms in contaminated runs.

Drug Treatment.—No efficient drug treatment is known.

The Kidney Worm (*Stephanuris dentatus*). (Fig. 5, F.).

The mature kidney worms live in the fat surrounding the kidneys and in the kidney tissues. They are stout worms measuring one to two inches in length, and have a greyish white mottled appearance. In New South Wales they occur mainly in the North Coast areas.

Life History.—The infective larvae penetrate the skin or are swallowed by the pig. By either route they eventually reach the liver where they wander about and grow to maturity in about six months. They leave the liver and migrate to the kidney fat where the female worms begin to lay eggs. Wandering immature worms may invade and damage the lungs, kidneys, and other organs. The eggs hatch when they are passed out in the urine and the larvae develop to the infective stage in about ten days. They survive for long periods in moist areas but are quickly killed by dryness, strong sunlight and low temperatures.

Damage Caused.—A heavy infestation produces an unthrifty pig. Economic loss from condemnation of affected organs, especially the liver (see Fig. 9), is considerable.

Principles of Control.—In districts where the kidney worm is prevalent clean concrete pens and yards are essential unless the pigs can be run in large, well-drained paddocks. Bad hygiene and overstocking are dangerous.

Drug Treatment.—No efficient drug treatment is known.

Flukes.

Flukes are generally flat, leaf-like worms with complicated life histories. In this country only one species is known to infest pigs. This is the common liver fluke (*Fasciola hepatica*). It is primarily a parasite of cattle and sheep, but if pigs are run on low, swampy ground they may become infested. The flukes spend part of their time in water snails after which they become encysted on grass or on plants in shallow water. Pigs become infested by swallowing the cysts. Flukes disease is diagnosed by finding the eggs in the droppings or, in the dead pig, by the evidence of flukes in the liver.

Tape Worms.

Tape worms are flat, segmented worms which live as adults in one animal and as

Fig. 9.—Pig Liver Condemned at the Abattoir because of Damage Caused by Worms.
[*Photo: G. A. Hendy.*]

bladder-like cysts in one or two other kinds of animal host. The first animal becomes infested by eating the flesh of the second containing the tape worm cysts.

The pig carries the bladder worm stages of two species, both of which grow to mature tape worms in the dog. These are:

(a) Hydatid Cysts (*Echinococcus granulosus*.—Hydatid cysts are found principally in the liver and lungs and contain numerous small white specks. Old bladder worms may die and become hardened and white. Dogs become infested by eating raw pig offal containing the cysts. Man as well as pigs may become infested with hydatid cysts if he accidentally swallows the tape worm eggs passed out in the droppings of dogs. Raw offal from pigs or from other farm animals which harbour the bladder worm stages should never be fed to dogs.

(*b*) The Thin-necked Bladder Worm (*Cysticercus tenuicollis*).—These may be found in any part of the body cavity but occur most frequently attached to the liver or the webbing of the bowel. They have the appearance of thin-walled, pendulous bags filled with clear fluid. The bladder worm stages are not very harmful to the pig, but the adult worms may seriously affect young dogs.

Acknowledgment.

The material used in the illustrations in this article was prepared and photographed by Mr. G. A. Hendy, Laboratory Assistant in Parasitology.

Reference Chart of Round Worms which Commonly Infest Pigs.

Worm.	Location.	How Pig Becomes Infested.	General Signs of Infestation.	Drug Treatment.	Method of Administration.
Red Stomach Worm (*Hyostrongylus rubidus*).	Stomach	By swallowing infective larvae in feed, water, soil, or pastures.	Digestive disturbances, unthriftiness.	Carbon bisulphide ...	By stomach tube or in capsules.
Large Stomach Worms (*Ascarops strongylina* and *Physocephalus sexalatus*.).	Stomach	By eating dung beetles containing the infective larvae.	Digestive disturbances, unthriftiness.	(*a*) Carbon Bisulphide. (*b*) Sodium fluoride	By stomach tube or in capsules. Dry powder in one day's dry ration.
Large Round Worm (*Ascaris lumbricoides*).	Small Bowel. Immature worms in liver and lungs.	By swallowing infective eggs in soil, feed or water.	Coughing, pneumonia, unthriftiness, digestive disturbances, stunted growth.	(*a*) Oil of Chenopodium. (*b*) Sodium fluoride	By stomach tube. Dry powder in one day's ration.
Bowel Thread Worm (*Strongyloides ransomi*).	Small Bowel ...	Infective larvae penetrate the skin or are swallowed.	Skin eruptions; heavy infestations cause scours and wasting in suckers and weaners.	No efficient drug treatment known.	....
Thorn-headed Worm (*Macracanthorhynchus hirudinaceus*).	Small Bowel ...	By eating beetle grubs containing the infective stages.	Digestive disturbances, peritonitis, unthriftiness.	Sodium fluoride ...	Dry powder in one day's dry ration.
Nodule Worms (*Oesophagostomum* sp.).	Large Bowel. Immature stages in nodules in bowel wall.	By swallowing infective larvae in feed, water, soil, or pastures.	Diarrhoea constipation, anaemia, general unthriftiness.	Phenothiazine ...	By stomach tube as a suspension, or in powder form mixed in the feed.
Whip Worm (*Trichuris trichuria*).	Blind gut and adjacent parts of the large bowel.	By swallowing infective eggs.	Heavy infestations cause unthriftiness in suckers and weaners.	No efficient drug treatment known.	....
Kidney Worm (*Stephanuris dentatus*).	Kidney fat; wandering worms in other parts of abdominal cavity; immature worms in skin, lymph glands, liver and lungs.	Infective larvae penetrate the skin or are swallowed in urine contaminated feed, water, soil or pastures.	General unthriftiness; skin eruptions.	No efficient drug treatment known.	....
Lung Worms (*Metastrongylus* sp.).	Lungs	By eating earth worms containing the infective larvae.	Bronchitis; pneumonia; unthriftiness in young pigs.	No efficient drug treatment known.	....

Computing and Measuring Drugs.

Drug quantities may be expressed in metric measures such as grams or cubic centimetres. Here is a conversion table for measures in common use:—

Weights.

28.5 grams (approx. 30 grams) = 1 ounce.

1 Kilogram (1,000 grams) = 2.2 lb. (2 lb. 3¼ ounces).

Fluid Measures.

3.5 cubic centimetres = 1 fluid drachm (approx. 1 teaspoonful).

30 cubic centimetres = 1 fluid ounce.

Dose rates are frequently given per pound or per kilogram live weight, e.g.:

Sodium fluoride:—0.15 gm. per lb. live weight.

Phenothiazine:—0.2 gm. per lb. live weight.

Oil of Chenopodium:—1 cubic centimetre per 25 lb. live weight.

Carbon bisulphide:—0.2 cubic centimetres per kilogram live weight.

In cases where only a few pigs of varying weights have to be treated individually it may be necessary to measure out small quantities of a drug. For fluids this can be done by using a glass pipette or a small measuring flask marked off in cubic centimetres. Small quantities of drugs in powder form cannot be weighed accurately on ordinary farm balances, but the local chemist will usually weigh out the required amounts.

When numbers of pigs have to be treated it is best to divide them into groups of approximately the same weight and stamina and then calculate and weigh out, in bulk, the amount of drug required for each group.

The following are examples of such calculations.

Example I.—To find the amount of sodium fluoride required to treat twenty pigs each weighing approximately 35 lb.

Total weight of pigs = 20 x 35 = 700 lb.

Dose rate of sodium fluoride:—0.15 gm. per 1 lb. live weight.

Required amount of sodium fluoride = 0.15 x 700 = 105 grams.

Approx. 30 grams = 1 ounce.

105 grams $= \frac{105}{30} = 3\frac{1}{2}$ ounces.

Example II. To find the amount of Oil of Chenopodium required for twenty pigs weighing 35 lb.

Total weight of pigs = 20 x 35 = 700 lb.

Dose rate:—1 cubic centimetre of Oil of Chenopodium per 25 lb. live weight in 1 ounce of castor oil.

Required amount of Oil of Chenopodium $= \frac{700}{25} = 28$ cubic centimetres.

28 cubic centimetres = approx. 1 fluid ounce.

Required proportions are:—

Oil of Chenopodium: 1 fluid ounce.

Castor oil: 19 fluid ounces.
Total: 20 fluid ounces.

Give each pig 1 fluid ounce of the mixture.

Example III.—To find the amount of Oil of Chenopodium required for ten pigs weighing 25 lb. and ten pigs weighing 50 lb.

Total weight of pigs = (10 x 25) + (10 x 50) = 250 + 500 = 750 lb.

Dose rate:—1 cubic centimetre Oil of Chenopodium per 25 lb. body weight in 1 ounce of castor oil (25 lb. pigs) and in 2 ounces castor oil (50 lb. pigs).

Required amount of Oil of Chenopodium $= \frac{750}{25} = 30$ cubic centimetres.

Required proportions are:

Oil of Chenopodium: 30 cubic centimetres (1 fluid ounce).

Castor oil: 29 fluid ounces.

Total: 30 fluid ounces.

Give each of the 25 lb. pigs 1 ounce of the mixture and each of the 50 lb. pigs 2 ounces of the mixture.

HYDATID DISEASE.

R. C. DENYER, B.V.Sc., Veterinary Officer.

HYDATID disease occurs most commonly in sheep and cattle, but it is in man that the disease is of greatest importance. This article describes the ways in which the incidence of the disease can be reduced in animals, thus minimising the risk of infection in man. Hydatid disease is very common in Australia, and in this State is found most frequently in the sheepraising districts of the tablelands.

How is the Disease Caused.

The life cycle of the parasite may be considered by starting with the adult form which is the dog tapeworm *Echinococcus granulosis*—is a very small, white worm which can be seen only with difficulty in the droppings. Like all tapeworms, this species consist of a series of segments immediately behind the head, which, when mature and containing ripe eggs, are shed and passed out in the droppings.

Two other common species of tapeworm infest the dog, but these can be readily recognised because of their large size, each segment being larger than the entire *Echinococcus granulosis* worm.

These segments may be picked up by a susceptible animal—sheep, cattle, pig or human. When swallowed they disintegrate and the eggs are released into the intestine where they hatch into tiny larval forms which penetrate the bowel wall and enter the blood stream. These parasites are then carried to the various organs of the body, becoming established, most commonly, in the liver and lungs. At this stage cysts are formed around the parasite. Each cyst contains a number of what are virtually small tapeworm heads. The cysts vary in size up to that of a walnut and are filled with fluid.

Unless the animal is slaughtered at this stage, and the organs containing the cysts are fed to a dog, the life cycle is interrupted. With age the parasites die and the cysts may contain yellow caseous material; such cysts are seen quite frequently, especially in cattle.

When a dog eats any infested organs, the cyst walls are broken down, and the tapeworm heads become attached to the bowel wall where they grow into adult tapeworms in a period of about two months.

Economic Importance of Hydatid Disease.

Most animals are susceptible to hydatid disease, but it is seen most frequently in sheep and cattle and not uncommonly in pigs. Symptoms of infection are rarely seen in the live animal and yet the liver and lungs are at times simply masses of hydatid cysts. Economic loss is occasioned principally by the condemnation at abattoirs of the affected organs, especially the liver, while at times it may be necessary to condemn the whole carcase if the cysts are widespread throughout the body.

Infection in Man.

Infection in man is usually acquired as a result of handling infested dogs and then partaking of food without previously having thoroughly washed the hands. This occurs as a result of the contamination of the coat of infested dogs by tapeworm eggs. Naturally this mode of infection is more common in children. Adults can acquire infection in a similar manner by smoking.

The danger of infection in man from contaminated water supplies and vegetables is

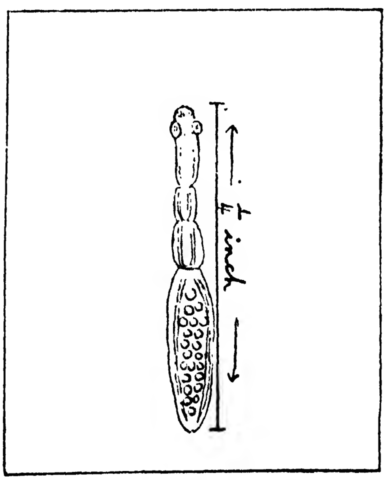


Fig. 1.—The Adult Hydatid Worm.

It is found only in the bowel of the dog. So small is this worm that any apparently healthy dog may harbour many thousands without showing signs of their presence.

apparently not as great as was at one time thought, although of course, both may be sources of infection on occasions. Other ways in which man may become infected include the contamination of food by flies carrying the eggs, inhalation of dust from contaminated ground and by the handling of cats, though these are less important sources of infection.

The dose rate of this preparation is 2 grains for each pound weight of the dog, and it is given mixed in milk. To ensure accuracy the dogs should be weighed and then a chemist should be asked to weigh out the dose required for each animal.

Where the source of infestation of the dogs persists, this treatment should be

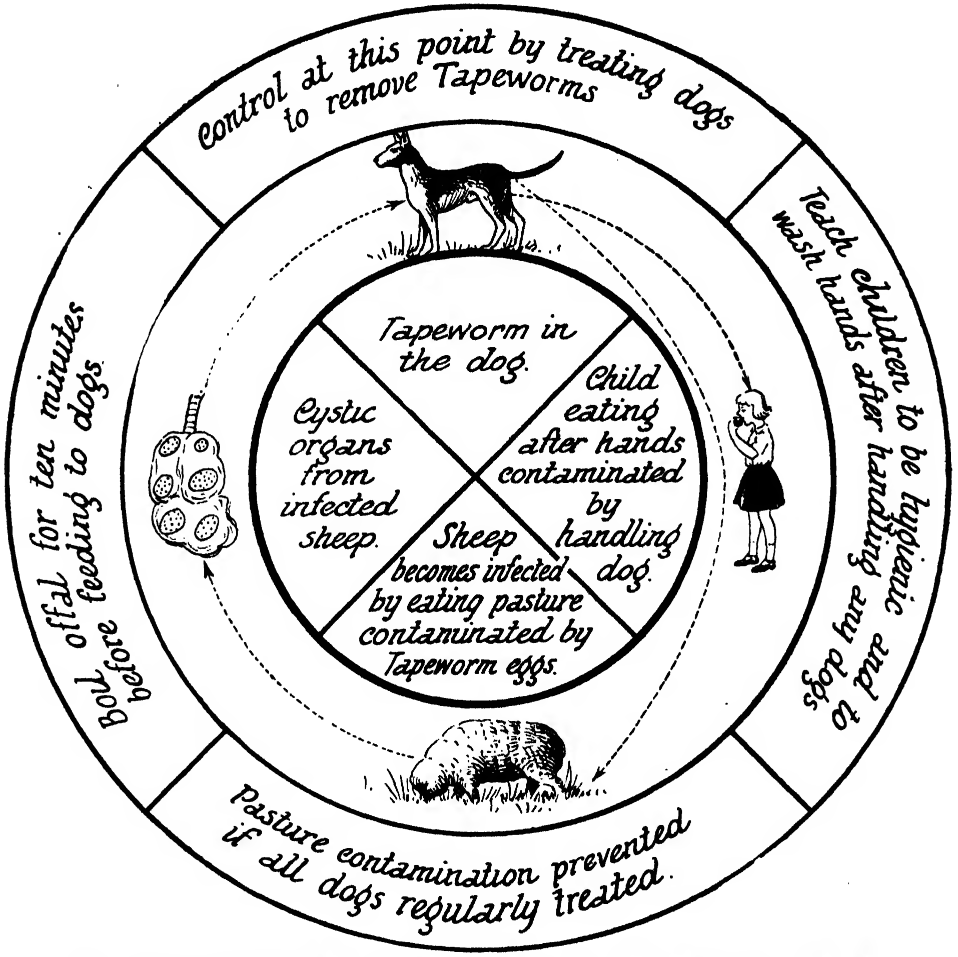


Fig. 2.—Diagram showing the Life Cycle of the Dog Tapeworm, with Recommended Control Measures for Hydatid Disease.

Control of Hydatid Disease.

It will be obvious from a study of the life cycle of the parasite that control measures may be instituted at one or more of the stages. These control measures are applied as follows:—

(*a*) *The hydatid tapeworm in the dog.*—Dogs may be freed from tapeworm infestations by treatment with powdered areca nut.

carried out every eight weeks to prevent the tapeworms from reaching maturity and laying eggs. By this method the parasite is prevented from completing its life cycle.

(*b*) *Tapeworm eggs in the soil.*—Control measures at this stage should be directed mainly towards the prevention of contamination of the vegetable garden and water supply by infested dogs. Bathing the dog

at intervals reduces, but does not eliminate the danger of acquiring infection from handling the animal.

(*c*) *Hydatid cysts in the live animal.*—This stage, of course, is the important one in man. In domestic animals nothing can be done to cause the death of the cysts. Indeed, not till the animal is slaughtered, and the cysts are fed to a dog, can the life cycle be completed.

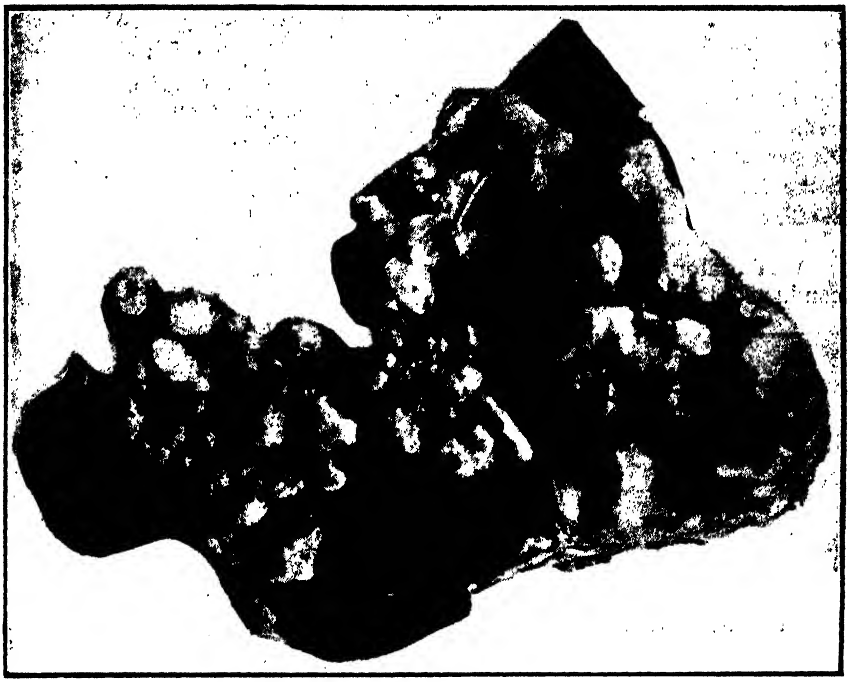
The latter can be done with a minimum of trouble if a bucket of water is put on to boil before killing a sheep for rations. By the time the dressing of the carcase has been completed, the offal in most cases would have received sufficient treatment.

Summary.

It will be evident that this disease is of greatest importance as a disease in man, in whom it is said to be the most serious

Fig. 3.—Hydatid Cysts in the Liver of a Sheep.

Dogs can only become infested with the adult hydatid worm by eating these cysts in uncooked meat. Cooking kills the cysts.



(*d*) *Hydatid cysts in offal of slaughtered animals.*—From the point of view of control this is the most important stage. If dogs are prevented from ingesting viable cysts, they cannot acquire infestations and the life cycle is interrupted. One of two things must be done to prevent infestation from this course:—

(i) *Do not feed affected offal to dogs; or*

(ii) *Boil the offal for* 10 *minutes before* feeding to the dogs.

parasitic disease in Australia, and in whom it may produce a fatal condition.

It should also be clear that the disease may be controlled by preventing the feeding of infected offal to dogs.

Thirdly, the dangers of infection in man can be reduced by giving careful attention to control measures such as treatment of infested dogs, prevention of contamination of vegetable garden and water supply by infested dogs, and avoidance of feeding infected offal to dogs.

EFFECT OF HEAT ON LUPIN SEED GERMINATION.

AMY MYERS, Seeds Officer and NORMA NICHOLLS, Assistant Seeds Officer.

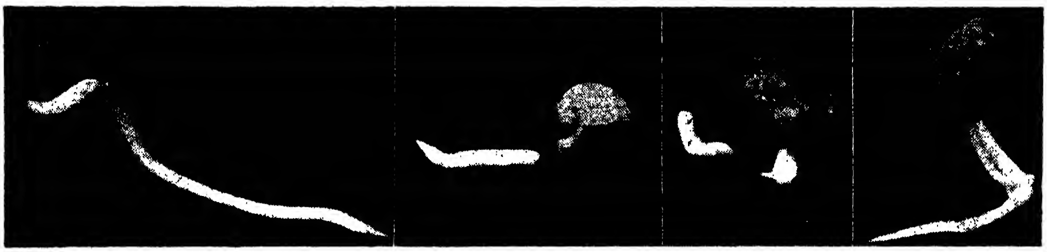
A SAMPLE of New Zealand Blue Field lupin seed which had been stacked in a warehouse in which a fire had occurred, was submitted some time ago to the Seed Testing Laboratory for a germination test. As the floor of the warehouse had been flooded with water it was feared that germination capacity might have been affected.

The test showed 65 per cent. of normally-developed seedlings and, in addition, another 30 per cent. of seedlings in which the roots broke from the embryonic stem, so that the seedlings were useless.

A laboratory experiment has now been conducted to investigate the effect of heat on lupin seed before germination. It showed that broken seedlings developed, as in the test of the original sample, as the result of submitting the seed to a high temperature (176 deg. Fahr.) for 3½ hours. The treated seed was tested under normal conditions of moisture and temperature.

The accompanying illustration shows typical seedlings from this test. It includes: (1) a normal seedling; (2) a seedling in which the root has broken from the embryonic stem after germination has begun; (3) an older seedling, in which adventitious roots have begun to grow from the point of breakage; (4) a seedling developing abnormally, apparently affected by the heat.

In the laboratory germination test, the seeds lie on, and are covered by moist cloth, and it was considered possible that excessive water during the tests, or the weight of the covering might also have caused breakages. The effects of these two factors were investigated by varying the amounts of water on the trays, and the thicknesses of the coverings. Moisture varied from almost dry to very wet, and the weight of the covering from no covering at all, then blotting paper only, up to two layers of thick towelling. In these tests the germination of normal seedlings averaged 80 per cent. with an average of 4 per cent. only of broken seedlings.



Germination of Heat-treated Lupin Seedlings.
1.—Normal seedling; 2.—Root broken from stem; 3.—Older seedling with adventitious roots; 4.—Abnormal seedling.

LUCERNE is more difficult to cure than any other kind of hay crop, and greater loss occurs to it than any other when improperly treated. Careful handling is required from the time the crop is cut until the hay is baled for market.

The eagerness with which buyers snap up well-cured lots of lucerne hay indicates the importance of curing and of marketing in the very best condition. They prefer hay that is green in colour, dry, free from weeds and rubbish, and which contains a large proportion of leaf. A dirty appearance, indicating careless handling in the field, or the slightest sign of heating in the bale causes buyers to reject the lot or to accept it only at much reduced prices. Since quality is of just the same importance when lucerne hay is fed on the farm, the same care is necessary in its treatment.

Lucerne should be cut just after the first flowers have appeared; the time at which many growers cut is when about one-tenth of the crop is in flower. The first crop of the season, however, may not flower and the time to cut is indicated by the second growth appearing from the crown of the plant.

Spraying Tests with—

SELECTIVE HORMONE-TYPE WEEDICIDES.

METHOXONE AND 2, 4-D PREPARATIONS.

A. JOHNSON, B.Sc.Agr., Agronomist.

THE progress made in recent years in control of weeds by the use of chemicals has become spectacular during the last two or three years as the result of the development of selective hormone-type weedicides.

Many other methods of weed control, except when applied to cultivated crops have the disadvantage that they prevent or interfere with crop production in the year they are applied.

Selective weedicides may be applied for the control of certain weeds in some crops without materially interfering with the growth of the crop. As well as being selective in their action, these sprays possess the advantages of being non-poisonous, non-inflammable, and non-corrosive, and in addition they are easy to mix and apply.

These substances damage or kill certain broad-leaved plants while doing relatively little harm to narrow-leaved plants such as members of the grass family. Their effect is to cause many broad-leaved plants literally to grow themselves to death. The result is often very weird and unnatural—the affected plants becoming contorted and twisted before dying.

Time of Application.

The hormone-type sprays are best applied during warm, still weather and when the plants to be sprayed are in a young, vigorous condition of growth. Once plants have become woody, or have reached the flowering stage, spraying is relatively ineffective. Quickest results are obtained in warm weather, and action may be long delayed during cold periods. Even under normal conditions, four to eight weeks may elapse from the time of application until death eventuates.

Weedicides Used.

A large number of weeds in various parts of New South Wales have been teated with both Methoxone and 2, 4-D preparations. Methoxone is a trade name of a 10 per cent. solution of sodium 4-chloro-2-methyl-phenoxyacetate, and 2, 4-D covers various formulations of 2, 4-dichloro-phenoxyacetic acid. Methoxone is on sale in liquid form while 2, 4-D is available in both liquid and powder form. The normal strength of application in both cases is as a 0.1 per cent. solution of the active principle. However, it varies according to the type of weed, and with the stage of growth of the weed.

Method of Application.

Sprays should be applied in as fine a form as possible through a convenient type of pump, such as a hand atomiser, knapsack spray bucket pump, or power-driven orchard spray. Enough spray should be applied to wet all the foliage, but not sufficient to cause appreciable run-off. With perennial weeds or with annuals that have previously set seed, more than one application of spray will usually be necessary. In some cases, it is necessary to add a wetting agent.

A recent development in application of these sprays is the use of a low-gallonage, low-pressure machine. This machine cuts down the quantity of water it is necessary to mix with the concentrated weedicide and is particularly valuable when large areas are to be sprayed.

Tests on New South Wales Weeds.

A summary of the results of tests conducted in many areas in this State is shown on page 582. It is emphasised that the tests that have been made to date are of a preliminary nature only. It is intended to carry out properly controlled and more critical experiments so that more exact information may be obtained. These results have been obtained through the co-operation of many workers under a variety of conditions. Further details, if required, may be obtained from the Division of Plant Industry, Department of Agriculture.

At this stage the following indications of susceptibility are given:—

Susceptible (in Growth Stages Tested).

Green Amaranth (*Amaranthus viridis*).

Lesser Joyweed (*Alternanthera denticulata*).

Wild Heliotrope or Caterpillar Weed (*Heliotropium europaeum*).

Paterson's Curse (*Echium plantagineum*).

Chilean Whitlow (*Paronychia brasiliana*).

Campion Bladder (*Silene cucubalis*).

Fat-hen (*Chenopodium album*).

Halbert-leaved Saltbush (*Rhagodia hastata*).

Roly Poly (*Bassia quinquecuspis*).

Saltbush (*Chenopodium* sp.).

Bathurst Burr (*Xanthium spinosum*).

Noogoora Burr (*Xanthium chinense*).

Cape Weed (*Cryptostemma calendulaceum*).

Cobblers' peg or Farmers' Friend (*Bidens pilosa*).

Cotula or Bachelors' Button (*Cotula australis*).

Crownbeard or Yellow Daisy (*Verbescina encelioides*).

Dandelion (*Taraxacum officinale*).

Flat Weed (*Hypochaerus*, spp.)

Perennial Rag Weed (*Ambrosia psilostachya*).

Prickly Lettuce (*Lactuca scariola*).

Stinking Roger (*Tagetes glandulifera*).

Thistle—Black or Spear (*Cirsium lanceolatum*).

Thistle—Sow (*Sonchus oleraceus*).

Wild Marigold (*Calendula arvense*).

Kidney Weed (*Dichondra repens*).

Perennial Morning Glory (*Ipomea leari*).

Hedge Mustard (*Sisymbrium officinale*).

Lesser Swine Cress (*Coronopus didymus*).

Hoary Cress (*Lepidium draba*).

Shepherds' Purse (*Capsella Bursa-pastoris*).

Camel Melon (*Cucumis myriocarpus*).

Castor Oil Tree (*Ricinus communis*).

Petty Spurge (*Euphorbia peplus*).

Crowfoot (*Erodium* spp.)

Horehound (*Marrubium vulgare*).

Wild Sage (*Salvia verbenacea*).

Annual Clovers in Lawns.

Marshmallow (*Malva parviflora*).

Red-flowered Mallow (*Modiola caroliniana*).

Common Fumitory (*Fumaria officinalis*).

Rough Poppy (*Papaver hybridum*).

Lamb's Tongue (*Plantago* spp.).

Dock (*Rumex crispus*).

Water Hyacinth (*Eichornia crassipes*).

Pigweed (*Portulacca oleracea*).

Scarlet Pimpernel (*Anagallis arvensis*).

Tree of Heaven (*Ailanthus glandulosa*).

Wild Gooseberry (*Nicandra physaloides*).

Duck Weed (*Hydrocotyle hirta*).

Stinking Pennywort (*Hydrocotyle laxifolia*).

Wild Carrot (*Daucus carota*).

Dwarf Nettle (*Urtica urens*).

Blue Top (*Verbena officinalis*).

Lantana (*Lantana camara*).

Caltrops (*Tribulus terrestris*).

Susceptible (in Seedling Stages only).

Saffron Thistle (*Carthamus lanatus*).

Pepper Weed (*Lepidium* sp.)

Mintweed (*Salvia reflexa*).

Paddy Lucerne (*Sida rhombifolia*).

Mexican Poppy (*Argemone mexicana*).

Wire Weed (*Polygonum aviculare*).

Moderately Susceptible.

Galvanised Burr (*Bassia Birchii*).

Cockspur, Maltese (*Centaurea melitensis*).

Russian Knapweed (*Centaurea picris*).

Skeleton Weed (*Chondrilla juncea*).

Bindweed (*Convolvulus arvense*).

St. John's Wort (*Hypericum perforatum*).

Burr Medic (*Medicago denticulata*).

Lucerne (*Medicago sativa*).

Subterranean Clover (*Trifolium subterraneum*).

Thornapple (*Datura stramonium*).

Purple Top (*Verbena bonariensis*).

Resistant (for Practical Purposes).

Yellow Burr Weed (*Amsinckia hispida*).

Variegated Thistle (*Silybum Marianum*).

Nut Grass (*Cyperus rotundis*).

Barley Grass (*Hordeum marinum*).

Blady Grass (*Imperata cylindrica*).

Buffalo Grass (*Stenotaphrum secundatum*).

Couch Grass (*Cynodon dactylon*).

Crab Grass (*Eleusine indica*).

Oats, Black (*Avena fatua*).

Oats, Wild (*Avena sterilis*).

Prairie Grass (*Bromus unioloides*).

Spear Grass (*Stipa* spp.).

Spear Grass, Three-awned (*Aristida vagans*).

Summer Grass (*Digitaria adscendans*).

Wallaby Grass (*Danthonia* spp.).

Wheat (*Triticum vulgare*).

Wimmera Rye Grass (*Lolium rigidum*).

Winter Grass (*Poa annua*).

Yass River Tussock (*Nasella trichotoma*).

Onion Weed (*Nothoscordum fragrans*).

Cockspur (*Cudrania javanensis*).

Soursop (*Oxalis cernua*).

Wood Sorrel (*Oxalis corniculatis*).

Inkberry (*Phytolacca octandra*).

Blackthorn (*Bursaria spinosa*).

Cathead or Double G (*Emex australis*).

Blackberry (*Rubus fruticosus*).

Sweet Briar (*Rosa rubiginosa*).

Nightshade (*Solanum nigrum*).

Clovers for Milk and Meat—*continued from page 562.*

Legumes Build up Soil Fertility.

All legumes add nitrogen to the soil by virtue of the bacteria contained in the nodules present on the roots. The nitrogen is taken from the atmosphere by the bacteria which convert it into a nitrogenous compound. Most of this nitrogenous food is stored in the nodules, but some of it is used by the host plant. When the plant dies and the nodules break down the nitrogen is liberated in the soil and, being in a readily assimilable form for plants, it is soon taken up by other plants, particularly grasses. Such a process is the equivalent of applying nitrogenous fertilisers such as sulphate of ammonia or nitrate of soda to the soil, and when it is considered that the amounts of these fertilisers available for agricultural purposes by the Australian farmer fall short of the demand (two-fifths of the quantity of these fertilisers used in Australia is imported), a greater effort should be made to encourage the growth of legumes. A greater use of pasture legumes in the farm rotation will thus help considerably to make up for the deficiency of nitrogenous fertilisers.

(*To be continued.*)

Grain Sorghum for Stock.

GRAIN sorghum is a foodstuff with which many stockowners have had little experience.

The grain is very similar in composition and food value to wheat and maize. It should be coarsely crushed or rolled for feeding to cattle and horses, and comparatively large quantities may be fed to cattle without producing digestive troubles. However, as it is a relatively heavy feed, it is best fed with some bulky feed such as chaff or silage or a bulky concentrate such as crushed oats or bran.

As with the other grain, sorghum has only a comparatively low protein content, and so must be supplemented with protein-rich feed such as lucerne or clover hay, or with protein concentrates such as linseed meal, or peanut meal. It may be substituted pound for pound for crushed wheat, crushed maize or crushed barley, and about four parts crushed grain sorghum may be regarded as equal to about five parts of crushed oats.

There is no necessity to crush the grain for pigs when it is given through self feeders, but if hand-fed to pigs it should be coarsely crushed, otherwise its digestibility will be considerably impaired. Sheep masticate all whole grain very thoroughly and there is no need to crush the grain for this stock.

Whole grain may be included in the grain ration for poultry, and crushed grain may be used as a considerable proportion of the mash.—DIVISION OF ANIMAL INDUSTRY.

Viticultural Notes.

H. L. MANUEL, Principal Fruit Officer (Viticulture).

Disbudding of Vines.

DISBUDDING is an important vineyard operation which is often neglected. Any labour devoted to this practice is well spent.

It is essential that an experienced hand be employed to do this work of rubbing off the shoots, and not merely any unskilled person. Strictly speaking the pruner should carry out the work, as he knows the reasons why he left certain wood on the vines at pruning time, and also what watershoots to leave upon the vines so that they can be made use of during next season's pruning.

Disbudding of vines greatly assists the winter pruning work; by making use of certain watershoots the structure of the vine can be reformed and the secondary arms shortened back.

The removal, during the early growing period, of useless and surplus shoots not only means putting strength into the remaining growth, but also assists the pruner to do cleaner work. With young vines, disbudding should never be neglected since it assists in the forming of the framework.

In the handling of budded or grafted phylloxera-resistant stocks, it is essential that the young vines be gone over several times during the growing season to remove any growth from the stock, as well as to tie the young vine growth to a stake.

Growers were reminded last month not to be caught napping, as many were last season, by downy mildew. Even if this coming season should turn out dry and downy mildew not make an appearance, spraying with Bordeaux mixture should be regarded as an insurance.

Where vine mite infestation has been heavy, colloidal sulphur can be added to the Bordeaux spray—adding 2 lb. to the 100 gallons of water in the spray.

A look-out should be kept for the caterpillars of the grapevine moth, and if noticed, the vines should be sprayed with arsenate of lead at the rate of 1 lb. powder to 40 gallons of water. Arsenate of lead can be combined with the Bordeaux spray.

In the vine nurseries, a sharp watch should also be kept for black beetles, and where present, the nursery rows treated with DDT spray by injecting or forcing the spray into the soil along the rows of the shooting cuttings. The beetle can do a fair amount of damage to the young nursery growth before being discovered.

Agriculture and Horticulture Courses at the Sydney Technical Colleges.

DURING recent years a wide range of courses has been developed at Sydney Technical College covering the various branches of agriculture and horticulture.

Certificate courses of three years' duration are offered to those engaged in agriculture and horticulture or an allied occupation. These provide both practical and theoretical training including the most modern scientific and technical developments in these fields. They are part-time courses available both by day and evening. The general educational standard for admission is the Intermediate Certificate or its equivalent and persons of any age may apply. The fee for a Certificate course is £3 3s. per year in advance.

Special courses are provided for those students with particular interests. Among these courses are: Poultry Farming, Dairy Technology, Greenkeeping, Garden Design, Forestry and Wood Technology. The fee for such courses is 25s. per year in advance.

Applications for enrolment in the 1949 session should be lodged during the week, commencing 21st February, 1949. Further details of these courses may be obtained from the Principal, Sydney Technical College.

THE

BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics.

BUYING A TRACTOR?

HIGH prices for most primary products and the relatively high incomes earned by nearly all primary producers during the later war years and since have caused many farmers either to purchase tractors and other expensive farm machinery, or actively to contemplate the purchase of such machinery—farmers who prior to the war did not regard their financial position as warranting the purchase of this type of equipment—and this despite the fact that such machinery is very much more expensive than it was in 1939, being, in many cases, more than double the pre-war price.

The "dollar position" and United States export policy have severely restricted the number of tractors reaching the Australian market since the end of the war, so that only a comparatively small number of farmers have been able to secure their much-prized new tractor; many thousands are still waiting. However, with substantially increased imports of British tractors of various types and sizes, and with the anticipated early production of American-designed tractors in Australia the tractor supply position, particularly insofar as small and medium-sized tractors is concerned, is showing definite signs of improvement. In the next twelve months many farmers will become the proud owner of a new tractor for the first time and many others will replace their old, worn-out machine with a new model.

It would be interesting to know how many of those who buy a new tractor take the time to figure out whether they can really afford it—whether it is really a business proposition.

On many farms, of course, a tractor is essential to the economic working of the property, but on many smaller farms and farms on which only a comparatively small area is cropped, a tractor is often a pure luxury, and an expensive luxury at that! Where a farmer has the money, let him spend it on luxuries by all means, if he so desires, but where the money must be borrowed, or where there is already a heavy liability on the property, such spending is an altogether different proposition. Past experience in farming communities all over the world shows that over-capitalisation of farms by the purchase, when times are prosperous, of expensive machinery and other equipment which is not essential to the working of the farm, is one of the greatest sources of trouble when economic conditions deteriorate.

Examine the Proposition Carefully.

Farmers could save themselves a lot of future worry if they were to carefully examine the purchase of additional capital equipment—whether it be a tractor or any-

thing else—looking at the transaction from a purely business viewpoint; not considering merely the immediate future but remembering that prices in the longer term will not always be as high as they are now.

The article that follows this page offers a warning against basing land valuations purely on present prices and suggests that the high incomes at present being enjoyed by most of the rural community should be used to consolidate the farmer's position, to pay off debts and to make those improvements which are an economic necessity, but not to make down payments on expensive equipment which is not essential and on which the instalments may be a source of severe embarrassment in a few years' time.

These remarks are addressed primarily to the farmer who has a mortgage on his property or liabilities of other kinds and who, consequently, must give careful thought to the expenditure of a sum sufficient to purchase a tractor, whether the purchase is to be in cash or on terms, and not to those few farmers who are in the fortunate position of having no liabilities and ample cash resources. The former, if he is wise, will, before finally deciding to purchase a tractor, ask himself the series of questions which follows. Unless all his answers are satisfactory he would be well advised to exercise caution if he wishes to avoid financial difficulties in the future.

QUESTIONS WHICH EVERY FARMER CONTEMPLATING THE PURCHASE OF A TRACTOR SHOULD ASK HIMSELF.

1. Is the tractor really necessary for the efficient working of the farm?

2. Could the work be performed equally well, and more economically, with horses, perhaps in conjunction with the services of a machinery contractor, or machinery pool?

3. Will I be able to meet payments without embarrassment if prices fall significantly?

4. What will my cash operating costs be per year?

5. What will be my overhead costs, including depreciation?

6. Will I be able to reduce my labour costs by purchasing a tractor?

7. Is it likely that the purchase of a tractor will increase my profits?

8. Finally—if it is decided that the purchase of a tractor is warranted—am I buying a tractor of the type and size most suited to my particular purpose, or would another size or type be more economical and just as useful?—P. C. DRUCE, Economics Research Officer.

RISING LAND VALUES.

IN the Annual Report of the Commonwealth Bank for the financial year 1947-48 the Governor (Mr. H. T. Armitage) draws attention to the danger of rising land values as follows: "The rise in the price of land, particularly of country land, which is a likely result of rising export prices and high incomes, is also a problem which seriously concerns the Central Bank. Some increase in the value of land may be justified, as a long-term movement, but there is clearly a danger that land values may rise to a level which is unjustified and excessive. Excessive land values can create difficulties for the whole economy. They encourage the growth of indebtedness, particularly on country lands; they will bring with them new increases in costs which will affect also rural production not for export. If our export prices fall, relatively to general costs and prices, as the present world shortage of food and raw materials is relieved, the burden of indebtedness on excessive land values may prove disastrous to many rural producers. The general higher level of costs will also intensify the balance of payments difficulties, which must follow any fall in export prices relative to import prices. Restraint on the growth of land values will help to avoid these difficulties."

The most serious danger inherent in this rise in land values is the growth of indebtedness, with which it is often associated. In the past prices of our rural products have usually risen faster than prices of other goods and services at times when prices in general were increasing, and have also fallen more rapidly in periods when prices

generally were falling. In other words, farmers' costs have tended to lag behind the prices farmers received for their products.

This can be shown to be true by reference to past movements in costs. According to net rural income figures prepared by W. H. Pawley, the proportion of costs to gross rural incomes rose from 29 per cent. in 1928-29 to 40 per cent. in 1930-31. This was, of course, a period when all prices fell rapidly. During the increase of prices accompanying the earlier periods of the last war, farmers' costs declined relatively to farmers' income. Thus, in 1938-39, costs represented 33 per cent. of gross rural incomes, but by 1942-43 the proportion had declined to 24 per cent. Similar evidence could be cited for the decline of prices in 1920, after the post-1914-18 war inflation had subsided.

As prices received by farmers seem likely to be near their peak at the present time, whilst there may yet be considerable increases in farmers' costs, the present time is one when indebtedness to banks and other lending institutions should be reduced as much as possible, rather than increased in the hope that current prices will last.

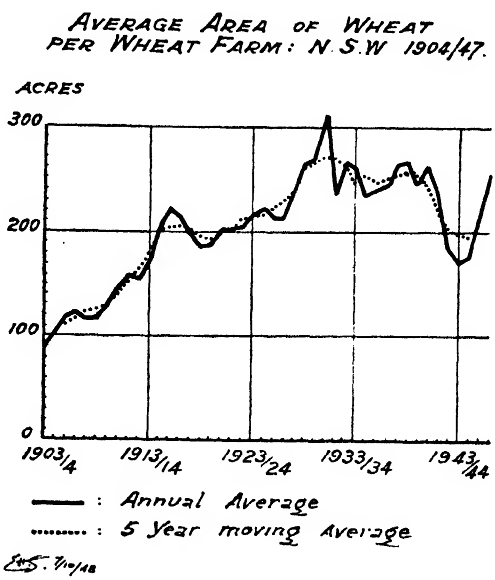
Rising land values are, of course, of world-wide occurrence at the moment. But it is interesting to note that the rise in land values in the United States of America, which has been proceeding at an average rate of 1 per cent. per month during the whole of the war years, slowed down considerably last year. In Australia, as a result of land sales control, land prices have been less exposed to inflationary pressures than in the United States of America, but the danger of an undue rise in land prices exists here too. Such a rise will best be avoided if buyers of agricultural land take a long-term view of their commitments in the light of a sober estimate of long-term prices, rather than allow the prevailing food shortage and high prices to lead them into too optimistic a frame of mind.—F. H. GRUEN, Economics Research Officer.

FARM WHEAT ACREAGE IS INCREASING AGAIN.

THE average area sown to wheat per wheat farm increased from less than 90 acres prior to 1904-5 to over 300 acres in 1930-31. Taking a five-year average, wheat acreage per wheat farm in the 'thirties was about two and a half times as large as at the beginning of the century. During the war years wheat acreage per farm declined substantially, but a steep increase during 1945-46 and 1946-47 has brought the average acreage per farm back to the pre-war figure.

The accompanying graph shows the increase in acreage planted to wheat per wheat farm since the beginning of the century. The figures were obtained by dividing the total acreage sown to wheat (for grain, hay and green feed) by the total number of rural holdings over 1 acre reporting cultivation of wheat in any one year.

A figure for the average wheat acreage harvested for grain per holding growing wheat for grain (*i.e.*, excluding those holdings which grow wheat only for hay and green feed) is not available prior to 1921. The figures for average wheat acreage harvested for grain show no marked differences in movement in comparison with those given in the graph. Prior to 1932-33 average the wheat acreage harvested for grain is about



6 to 15 acres below the average wheat acreages for all purposes per farm. Between

1932-33 and 1938-39 there is little difference in the two figures, and since 1938-39 wheat acreage harvested for grain per farm is about 8 to 10 acres above the wheat acreage for all purposes per farm.

The marked overall increase in wheat acreage per farm since 1903-4 is, of course, largely the result of increased mechanisation, which has greatly increased the area which can be sown and harvested by one man. The wide differences which occur from year to year are partly due to different seasonal conditions and partly due to changing prospects of wheat prices. When the seasons appear favourable at the time of sowing, a farmer will sow more than when lack of adequate rainfall during April and May reduce the likelihood of a good crop. The extremely large area per farm sown to wheat in 1930-31 is probably partly due to good seasonal conditions and partly the result of the "grow more wheat" campaign then in full swing.

After 1930-31 the upward trend in wheat acreages per farm seemed to come to a stop for a decade. This was probably a result of the very depressed condition of the wheat growing industry.

During the war years the uncertainty facing the industry and the encouragement given to sow small acreages by means of a differential guaranteed price under the "Scully Plan" led to a considerable decline in wheat acreages per farm. The shortage, of manpower was probably also a contributing factor.

In the last two years, wheat acreages per farm have increased considerably and are now substantially the same as before World War II. Increasing mechanisation in the next few years will probably lead to a resumption in the long-term upward trend, unless wheat prices fall to extremely low levels, which does not appear likely at the present time.—F. H. GRUEN, Economics Research Officer.

Publications on Economics Available.

FROM time to time reprints are made of articles published in the Division's Review of Marketing and Agricultural Economics, and these are available, on request to the Chief, Division of Marketing and Agricultural Economics.

The undermentioned reprints are available and will gladly be sent to interested farmers (the date in brackets indicates the date of original publication):—

"Production and Distribution in the Australian Egg Industry" (October, 1946).

"Hourly Tractor Costs in N.S.W.—Coastal Districts" (January, 1947).

"Dairy Farming as a Business" (April, 1947).

"The Unit Cost of Producing Agricultural Products" (November, 1947).

"F.A.O.—The Background—The History—The Task" (October, November, December, 1947).

"A Review of the Financial Position of Eighteen Central-western Wheat-Sheep Farms in 1945-46" (January, 1948).

"Keeping Farm Records" (reprinted from the *Agricultural Gazette*).

Benefits of Underground Orchard Drainage.

ORCHARDISTS are becoming more aware of the importance of underground drainage, owing to constant emphasis by the Department and to the protracted periods of wet weather experienced over the past two years.

The benefits of draining have been exemplified in a considerable area affected by hard pan at Pitt Town.

The first underground drains at Pitt Town were laid down some three years ago. In 1947 one grower—with departmental assistance and advice, and before planting—drained some 7 acres of an area of about 30 acres. Neighbouring growers who observed the effects during the past wet summer are now planning to construct underground drains on their own properties.

In the Hills District, where natural slopes have lulled growers into a sense of false security, there has also been a general awakening to the necessity for underground drainage; and each year sees an increasing area of drains laid down.

High costs and the present shortage of agricultural pipes have retarded this work, but the progress made, nevertheless, is appreciable and definite.—DIVISION OF HORTICULTURE.

FRUITGROWING

SUMMER TRAINING OF STONE FRUIT TREES

On the Murrumbidgee Irrigation Area.

EFFECT ON WINTER PRUNING.

J. R. DAVISON, Fruit Inspector.

A SYSTEM of summer treatment of Murrumbidgee Irrigation Area stone fruit trees is described, which avoids most of the undesirable results of hard winter pruning—delayed maturity, uneven development and waste of tree energy in unwanted growth.

By its use the desired number of leaders can be developed and the energy of the tree so directed that winter pruning is little more than a removal of excess fruiting laterals.

It has for some time been recognised that the hard winter pruning of stone fruit trees, and in particular, peaches, on the Murrumbidgee Irrigation Area, is too severe on the tree. Hard cutting has caused trees to take longer to come into bearing than is necessary, and has also resulted in smaller trees at maturity. At the same time, less severe pruning in the winter has frequently produced trees which are somewhat narrower. and which have fewer limbs than are desirable. The greater the number of well-spaced limbs, the greater the fruit-bearing area in the lower portions of the tree. The narrower the tree, the higher will the greater part of its crop be carried.

Limbs of stone fruit trees on the Murrumbidgee Irrigation Area tend to grow unevenly. The prevailing winds blow the western side in and the eastern side out. The western side does not usually grow as strongly as the rest of the tree and tends to produce more fruiting laterals. When such limbs are "cut according to strength," *i.e.*, pruned severely as was the old practice, the tree becomes progressively more and more lopsided.

Fig. 1.—Golden Queen Peach Tree, Photographed in December, 1946.

Planted 1945, summer trained in the first year, and winter pruned (in 1946) to unstopped laterals.

Fig. 2.—The Same Tree after Winter Pruning in 1948.

Pruning was confined to removal of excess light fruiting laterals.

Fig. 3.—Development of Leaders during 1947-48.

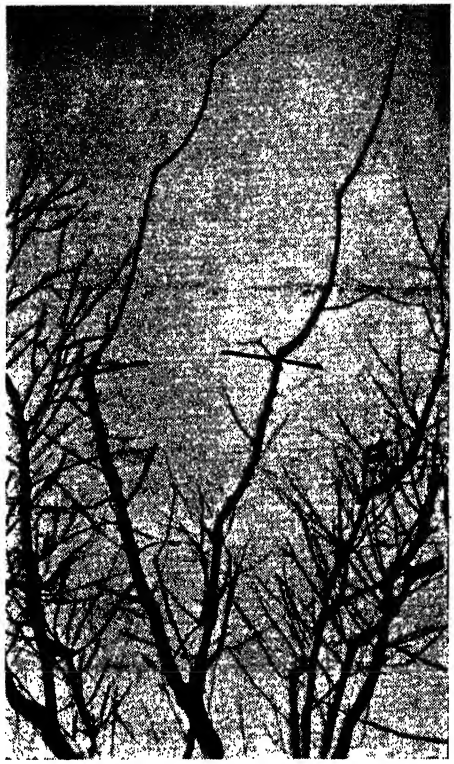


Fig. 4.—Treatment of These Leaders at 1948 Winter Pruning.

With peaches, the introduction of pruning to the "unstopped lateral," particularly on the windward side, coupled with somewhat harder cutting of the stronger limbs to level off the tops of the season's growth, has done much to improve the shape and growth of the trees. Even so, this type of winter pruning falls far short of what can be done to shape a tree evenly, and to bring it into production quickly.

Fig. 5.—Leader showing Four Distinct Steps of Four Monthly Summer Toppings.

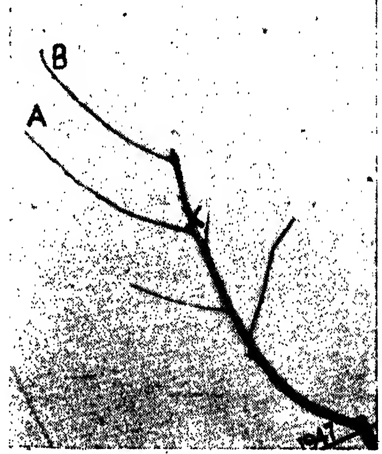


Fig. 6.—Method of Forcing the Leader Out by Cutting to a Side Lateral.

In order to produce the inverted 60 degree cone, defined-leader type of tree favoured for Area conditions, it is necessary to cut fairly hard in the first year after

Fig. 7.—A Phillip Peach Planted 1944 and given Summer Treatment for the First Three Years.
After winter pruning in 1948.

planting, in order to produce sufficient well-spaced limbs. This cutting induces characteristic growths which must be controlled. Strong competitive shoots arise from near those required as leaders; other rank growths on the insides of the limbs, apart from shading out the weaker, more desirable types of fruiting laterals, use up a great amount of tree energy which is wasted when these unwanted growths are cut out at the winter's pruning. Strong outside shoots often force the leaders into too upright growth, and at the same time are themselves at too wide an angle to be used as alternative leaders.

Summer treatment can obviate most, if not all, of these faults. The desired number of leaders can be developed, and the energy of the tree so directed that the winter pruning is little more than a removal of excess fruiting laterals, none of which are any thicker than a lead pencil, and no more than about 15 inches in length.

Summer Treatment of Peaches.

"Tipping," "nipping back," and "topping," are terms applied to the practice of removing the growing tips of shoots not required in forming the framework of the tree. "Tipping" or "nipping back" refer, in general, to the removal of only the sappy 2 to 4 inches of end growth. "Topping," although it can be similarly applied, may also mean a much heavier type of cut, and the removal of up to 12 inches or more of growth. This type of topping is done mainly where the minimum number of treatments is given, and will be discussed later (see page 594).

Probably the best way to describe the treatment necessary to obtain the best results is to follow the development of a Golden Queen peach tree from the time of planting out in 1945 until it was pruned in winter, 1948.

At planting, the tree was reduced to three fairly evenly spaced arms, 10, 12, and 15 inches long, respectively, each cut to two suitably spaced buds intended to give a

Fig. 8.—A Pullar Peach after Winter Pruning, Four Years from Planting (1944).
Summer trained in 1944, 1945 and 1946.

duplication of the original number during the first year's growth.

During the first season, when the leading shoots were 15 to 18 inches long, they produced near their tips several short secondary growths. One or two of these on each shoot, suitably placed, were left untipped, the original leading shoot and all other growths being checked by nipping off the soft tips. This was repeated at fortnightly intervals until March, by which time the tree was furnished with seven leaders.

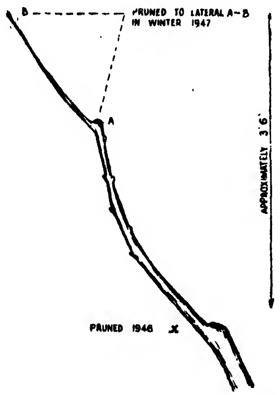


Fig. 9.—Diagram of Dormant Leader Pruned to Unstopped Lateral.

In the winter of 1946, these were all pruned to an unstopped lateral. During the following season the treatment given in the previous year was repeated, and this produced eleven leaders, evenly spaced and at the required angle of 30 degrees from the vertical. Fig. 1 shows the tree in December, 1946.

After winter pruning in 1947, the tree was about 8 feet high. Fig 2 shows the tree after pruning in winter, 1948. A light type of fruiting lateral developed as a result of the summer treatment. The pruning was practically confined to removal of excess fruiting laterals, shown heaped at the base of the trunk. The tree was by then 11 feet high and furnished with nineteen leaders.

Figs. 3 and 4 shows the development and treatment of two leaders at winter pruning, 1948.

Four Stages of Treatment given in 1947-48.

Observation of growth resulting from summer topping of this and many other trees since 1944 suggested that there might be defined stages of growth that could be used in topping at longer intervals than once a fortnight. The best times appeared to be from November on to February, four treatments at a month apart. Treatment after this could well be dispensed with.

Fig. 5 shows the four distinct steps of the four monthly summer toppings. It is not likely that the development would have been so distinct in either the first or second year of growth. The actual angle on the tree was 30 degrees from the vertical, which gives the desired 60 degrees angle at the crotch.

Fig. 6 depicts a method of forcing out the leader by cutting the shoot immediately above a suitably placed side lateral. The top shoot, if developed early, can be removed in January; if developed later on in the season, it is just tipped and removed at the winter pruning.

The development of a typical limb is traced in the sketches shown in Figs. 9 to 14, the last being a reasonably faithful reproduction of an actual limb. They are drawn to scale, and growth can be gauged by comparison with the line drawn vertically on the right-hand side of each sketch. No attempt was made to put all the buds in, as the main interest is the length and strength of growth made.

Fig. 9 shows the dormant limb before the commencement of spring growth in 1947—pruned to the unstopped lateral.

Fig. 10 (Stage 1).—This shows the way in which the dormant buds shot and the stage at which the first treatment took place —November, 1947. Leading lateral A-B has extended to B_2, and all the laterals marked "I" have developed from buds that were dormant in the winter. Everything but the lateral at B_1 was tipped.

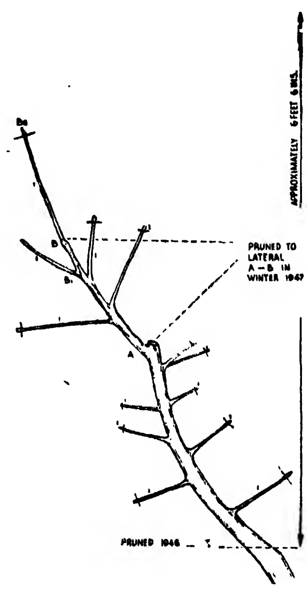


Fig. 10.—First Stage Summer Treatmen .

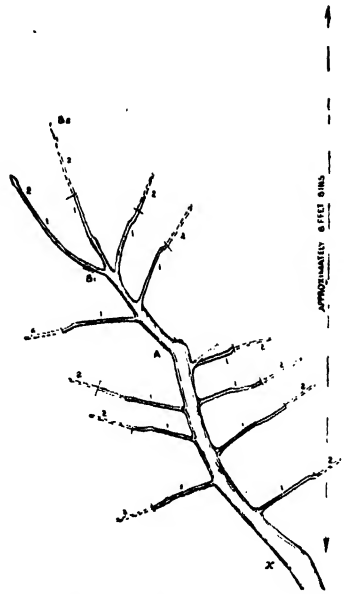


Fig. 11.—Second Stage Treatment (in December).

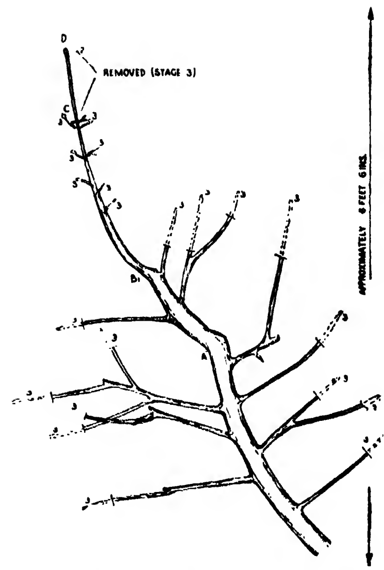


Fig. 12.—Stage Three of Treatment.

Fig. 11 (Stage 2) shows the limb in December. The dotted portions "2" represent what was cut off. Note that the laterals were kept back nearly to the length they were in Stage 1.

Fig. 12 (Stage 3).—This shows how the nipped-back laterals had extended by January, and how the untopped lateral at B_1 had gained vigour to become the leading shoot. The extensions were topped as marked "3."

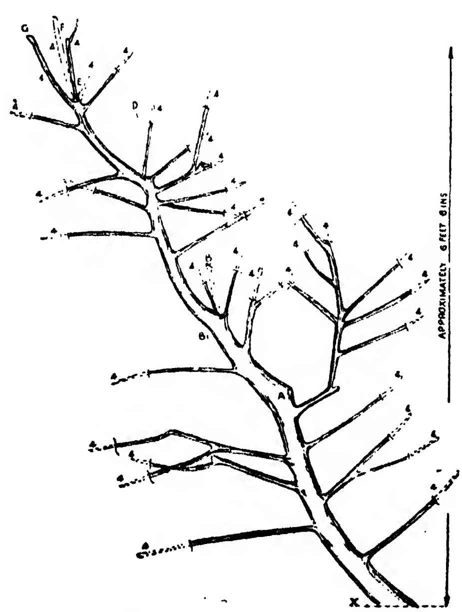


Fig. 13.—Fourth Stage Treatment (in March).

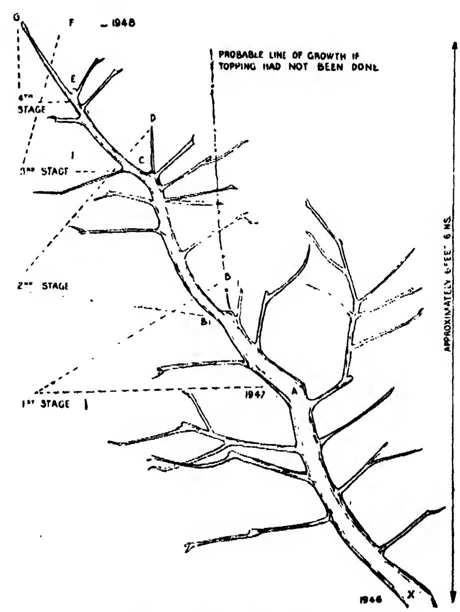


Fig. 14.—Diagram of Limb at Winter Pruning following Summer Treatment.

Fig. 13 (Stage 4).—Fig. 13 shows the limb in February at the time of the last treatment, and how the growth had developed since the previous month. The extensions marked "4" are the last growths made, and again the dotted lines indicate the parts removed.

Fig. 14 shows the limb at the time of pruning in the winter of 1948. Not much growth has been made by the laterals since the last topping in February, but all the laterals shown have developed good fruiting buds for their whole length. Because of the control of these potentially strong inside shoots, all laterals were similarly well furnished with fruiting buds, no matter from which limb or part of limb they sprang. There were no spindly shoots with only one or two fruit buds at their tips, or no laterals killed out by shading as is the case when strong inside growths are allowed to develop unchecked.

One very interesting fact was noticed. All buds that were dormant at the time of winter pruning, and all buds that developed on shoots which grew in the earlier part of the season, produced laterals by the end of the growing period. These, as indicated earlier, developed as fruiting shoots.

Fig. 14 also shows (by a dotted line), what would probably have been the direction of growth taken had no summer treatment been carried out.

From this description it should be fairly clear how much peach trees can benefit from summer treatment during the first three years of growth. Topping at about fortnightly intervals throughout the growing period is required to achieve the optimum result. Realization of the impossibility of such an undertaking on a commercial scale has probably led many growers to do nothing, when some type of treatment more within range of achievements would have interested them very much.

Any lesser number of treatments than those sketched in Figs. 9 to 14 will obviously give less pleasing results, but a good alternative treatment, taking into consideration the pressure of harvesting work in December, is one consisting of two toppings—the first in late November, and the second in January. Even one topping in December will give some definite gain, but there will still be much heavy wood to be removed at the winter pruning.

Treatment in Two Stages.

At the time of the first of these two treatments, the limbs will have growth similar to that shown in Fig. 10, although the growths will be longer and a little stouter, and, of course, somewhat more upright. Everything not required for framework should be topped. Some discretion may be used with obviously weak shoots, and they may be ignored. A sharp knife is the best means of topping, as the thumb nail gets rather sore after a few trees have been treated.

The second treatment takes place at a time when the growth made will somewhat resemble that shown in Fig. 12. It will be noted that many laterals, and especially the upright inside growths, will have grown strongly and will have developed secondaries near their tips. Quite a number may be at least as high as the chosen leaders. All laterals growing more or less horizontally should be checked by removing the soft tip growth, or even more when they are unduly strong. The strong inside growths are treated drastically; they are reduced to well below the level of the ends of the laterals chosen as leading shoots. These leading laterals are not tipped, but all that is growing from above the points from which they start on the original leading laterals is cut right out. It is as well, when making this cut, to leave a good stub, as, owing to the sappy nature of the wood at this time of the year, there will be a certain amount of drying out. If the cut is made too close to the lateral it may be affected and grow poorly.

Figs. 7 and 8 show, respectively, a Phillip and Pullar after pruning in 1948. Both were planted out in 1944. These with the rest of the trees in an area of 2 acres were treated fairly frequently during the first two years, but during the third had only the two treatments described in the last paragraph. During the fourth year they were not topped at all, and it is obvious from the photographs that they would have benefited from some attention. However, they developed much better than would have been the case had no topping been done at all in the earlier years.

(To be concluded.)

In infected plants, whether tomatoes or weeds, the bacteria occur in great numbers in the spots, from which they escape immediately the lesions become wet. The bacteria in droplets of moisture are capable of causing the formation of new spots on any part of the plant on which they come to rest. Thus, during rainy weather,

Fig. 2.—Lesions of Bacterial Spot on a "Hand" of Tomatoes.

particularly if strong winds are blowing, the disease may be spread rapidly through a crop from a few affected plants. Similarly, droplets of moisture from affected leaves may fall onto and affect clusters of fruit. Overhead irrigation acts in a manner similar to rain and should be avoided if trench irrigation in any form is practicable.

Control.

Seed Sterilisation.

Unless it is known for sure that the seed being used has been derived from healthy fruit, some form of seed treatment should be practised. Although no experimental evidence is available at present, general observations suggest that the acetic acid treatment, as used for the control of bacterial canker, is of little value in destroying the bacterial spot organism. Thus, there is no guarantee that acid-treated seed, as sold by seed merchants, is free of the bacterial spot disease.

Top: Fig. 3.—Scab-like Lesions of Bacterial Spot Make Tomatoes Unmarketable.
Bottom: Fig. 4.—Bacterial Spot Often Attacks the Scar of the Tomato Fruit.

Two forms of seed treatment have proved useful for eliminating bacterial spot:—

(*a*) *Mercuric Chloride Dip.*—A solution of corrosive sublimate is prepared by dissolving ⅛ oz. mercuric chloride in a little hot water.* When dissolved, make up to 12 pints with cold water. Pack

* Wooden, glass or enamel containers must be used with this dip; metal is unsuitable.

the seed loosely in cheesecloth and submerge in the solution. Knead the bag thoroughly to expel all air and thus make sure that all the seeds are wet. At the end of exactly five minutes remove the seeds and wash under running water for fifteen minutes, or rinse with at least six changes of water. Unless the corrosive sublimate is washed away, the seeds will fail to germinate satisfactorily.

(*b*) *Hot Water Treatment.*—This is the most desirable treatment as it eliminates some diseases which are not affected by corrosive sublimate.

Wrap the seeds loosely in cheesecloth and submerge them in water previously heated to a temperature of 122° F. (50° C.). This temperature must be measured by an *accurate* thermometer. Knead the bag to make sure that all air bubbles are released and hold the temperature constant at 122° F. for half an hour. After thirty minutes remove the seed and cool it by plunging the bag into cold water. Dry the seed by spreading it out in thin layers.

A suitable container for hot water is illustrated in Fig. 5.

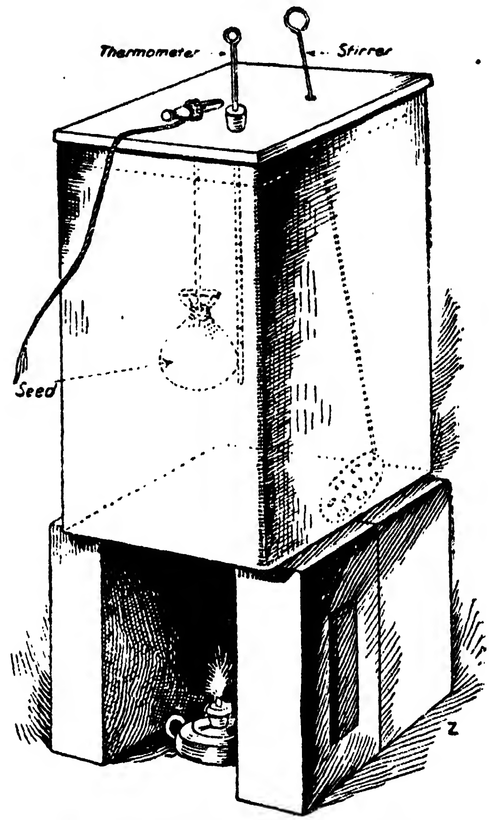


Fig. 5.—Illustration of Kerosene Tin Fitted Up for Hot Water Treatment of Seed.

Rotation of Crops.

The bacterium which causes the disease is known to be capable of surviving in the soil for two or three seasons. A crop rotation of four years is therefore desirable. In fact, rotation should be a standard practice for many diseases other than bacterial spot.

Irrigation.

Wherever possible, overhead irrigation should be avoided. A lightly affected crop is likely to become seriously attacked if the bacteria are distributed in droplets of water. Spray irrigation not only distributes bacteria and spores of fungous diseases, but also tends to wash off protective sprays and dusts. Some form of trench irrigation is recommended, but care must be taken to avoid the application of excess moisture as tomatoes are adversely affected by "wet feet."

Destruction of Weeds.

Weeds should be kept down as much as possible, as some, which act as alternate hosts for the bacterium, may ruin the beneficial effects of crop rotation.

Spraying.

No spray is completely effective in controlling the disease. However, observations suggest that home-made Bordeaux Mixture 2-2-40 will slow down the rate of spread from plant to plant. This does not appear to be true of ready-mixed commercial copper sprays.

BORDEAUX MIXTURE

Has Superior Weathering Properties.

Bordeaux Mixture, prepared by mixing a solution of bluestone (copper sulphate) with a suspension of lime (either quicklime or hydrated lime), owes its name to the Bordeaux region in France where it first came into use for the control of downy mildew disease of grapes in the period 1882-1885.

Following its success against this grape disease, Bordeaux Mixture quickly came into widespread use for the control of many fungous diseases of plants. It was, however, found that Bordeaux Mixture caused injury on certain plants and also that it was not effective for the control of some diseases.

For example, Bordeaux Mixture is not recommended for any of the sprays after the first or "green tip" stage spraying of apples for the control of the black spot or scab disease. If Bordeaux Mixture is used for any of the subsequent sprayings, russeting of the fruit is liable to occur and, for this reason, lime sulphur is used for these later sprays. Again, in the case of the leaf mould or leaf mildew disease of glasshouse tomatoes, it has been found that Bordeaux Mixture is not as effective as Shirlan AG.

Although Bordeaux Mixture cannot be used for all diseases and on all types of plants where a fungicidal spray is required, it has remained for the last sixty years the most widely used and most generally useful fungicidal spray. It still retains this No. 1 position.

Bordeaux Substitutes.

Almost since Bordeaux Mixture was first introduced, there have been attempts to produce substitutes in the form of other copper sprays. One of the first of these was "Burgundy Mixture" prepared from bluestone and washing soda (sodium carbonate). Another was "eau celeste" ("sky blue water") from bluestone and ammonia More recently there have been introduced certain "fixed copper" sprays such as cuprous oxide and copper oxychloride. Some of these latter materials, especially copper oxychloride preparations sold under local trade names such as "Cuprox," "Oxicop" and "Soltosan" have a value in that they are somewhat easier to prepare than Bordeaux Mixture.

It has been found, however, that none of these Bordeaux substitutes consistently gives such good disease control as home-made Bordeaux Mixture. The reason for this is that Bordeaux Mixture has very superior weathering properties, *i.e.,* it has what is known as good "tenacity"—the property of remaining on leaves and fruits for a longer time. Since the main purpose of any fungicidal spray is to place a protective film of spray deposit on the leaves, stems or fruits to prevent germination of any parasitic fungous spores which may be there or which may subsequently reach the plant parts, the value of good weathering properties is apparent. If a spray material is completely washed off in the first shower of rain, it is of less value than one which stays longer on the leaves.

Most Economical Spray.

Not only is home-made Bordeaux Mixture superior in weathering properties, but it is also considerably cheaper (about half the price) than any of the substitute materials on the market.

In recent years many new organic chemicals have been tested as spraying fungicides, particularly in the United States, and it is probable that some of these will replace Boreaux Mixture in the control of certain diseases. Most of the new materials which have been tried, however, whilst very satisfactory in other respects, have weathering properties which are not as good as those of Bordeaux Mixture.

Bean Seed Certification.

THE bean seed certification scheme was continued during 1947-48, the fifth successive season of the operation of the scheme. A total of 762 acres (148 crops) was inspected and 365 acres (68 crops) were passed for certification. About 65 per cent. of the certified seed consisted of Brown Beauty, 33 per cent. Hawkesbury Wonder and the remaining 2 per cent. comprised the varieties Tweed Wonder, Wellington Wonder and Clarendon Wonder.

There have been no important alterations for the 1948-49 season in the rules governing certification, and any bean growers who are interested may secure a copy of these rules on application to the Department.

The certification scheme has been of value not only in providing certified seed for growers each year, but also in raising the standard of uncertified seed on the market. Much of the uncertified seed produced each year is now practically equal in standard to that of certified seed. However, as a small amount of uncertified seed carrying a fair degree of infection with halo blight, anthracnose or American common blight still finds its way on to the markets, green bean growers are advised to secure certified seed where this is available.

Two varieties, of which most of the available seed is carrying either halo blight or anthracnose (or both diseases) are Canadian Wonder and Startler Wax. These are now mainly grown as home garden varieties, but some commercial plantings of Canadian Wonder are still made. The planting of diseased seed of these varieties may mean not only a severely diseased crop but the spread of halo blight or anthracnose to other beans planted nearby.

Spread of Asparagus Under Irrigation.

Suggestion of Using Only Male Strains.

THE spread of asparagus on the Murrumbidgee Irrigation Area by bird-disseminated seeds has been the subject of many enquiries received by the Department of Agriculture.

Varieties planted many years ago are reported to have spread over quite a large area, constituting a considerable nuisance.

Discussing the suggestion of using only male strains of asparagus for commercial planting, A. C. Orman, Special Agronomist of the Department, states that while this practice may be practicable for the home grower, it is very doubtful whether it would be an economical proposition for the large commercial grower.

In the first place it would be necessary to allow the seedlings to go into the second year in order to determine their sex, and then to peg all male plants so that they could be separated during the following winter when lifting the crowns. The cost involved in doing this would be too great to be economical.

Another objection, points out Mr. Orman, is that the crowns are usually lifted with mechanical equipment and this would be quite impossible if only male plants were to be used. It would mean individual hand forking of each plant.

Two seeds frequently fall together even with the best of sowing machinery, and it would be almost impossible to separate the plants after two seasons' growth.

Readers are advised that the C.S.I.R. Information Service has changed its address and is now located at C.S.I.R. Head Office, 314 Albert-street, East Melbourne, C. 2. Telephone JA 6611.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Mullumbimby	November 10, 11
Bangalow	November 17, 18
Nimbin	November 24, 25

1949.

Albion Park	January 14, 15
Dapto	January 21, 22
Lithgow	February 4, 5
Liverpool	February 5, 6
Luddenham	February 11, 12
Paterson	February 11, 12
Dorrigo (H. S. Doust)	February 16, 17
Tenterfield	February 17, 18, 19
Gunning	February 18, 19
Wyong (F. Akhurst)	February 18, 19
Newcastle (P. Legoe)	February 23 to 26
Rylstone	February 25
Guyra	February 25, 26
St. Ives	February 25, 26
Yass	February 25, 26
Coonabarabran (M. J. Hennessy)	March 1, 2
Walcha	March 1, 2
West Maitland (R. E. Holroyde)	March 2-5
Glen Innes	March 3, 4, 5
Comboyne (W. R. Cooke)	March 3, 4
Penrith (A. Tornaros)	March 4, 5
Mudgee	March 4, 5
Queanbeyan	March 4, 5
Uralla	March 4, 5
Tumbarumba (Mrs. U. H. O'Shea)	March 8, 9
Gulgong (T. Amies)	March 9
Blacktown	March 11, 12
Braidwood	March 11, 12
Burrowa	March 11, 12
Cessnock	March 11, 12
Inverell	March 11, 12
Dunedoo	March 14
Mendooran	March 16
Armidale	March 17, 18, 19
Crookwell	March 17, 18, 19
Binnaway	March 18
Barraba	March 18, 19
Gloucester (Mrs. M. A. Newton)	March 18, 19
Gresford	March 18, 19
Parramatta	March 18, 19
Baradine	March 22, 23
Warialda	March 22, 23
Taralga	March 24, 25
Wauchope (L. Steel)	March 24, 25
A.C.T.	March 25, 26
Bingara	March 25, 26
Castle Hill	March 25, 26
Dungog	March 25, 26
Manilla	March 25, 26
Muswellbrook	March 29, 30
Tamworth	March 29, 30, 31
Camden (G. V. Sidman)	March 31, April 1, 2
Goulburn	March 31, April 1, 2
Quirindi	April 1, 2
Sydney Royal	April 9 to 19
Gunnedah	April 26, 27, 28
Kempsey (C. H. Riggs)	April 26, 27, 28
Boggabri	April 29, 30
Horsley (J. A. Siggers)	April 30
Narrabri	May 5, 6
Grafton (C. C. Pitt)	May 5, 6, 7
Hawkesbury District (Clarendon), (T. J. Cambridge)	May 5, 6, 7

Approved Vegetable Seed—November, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—continued.

Cauliflower—

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Tomato—

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

GROW MORE LUCERNE

with

"NUNAN" SPRAY IRRIGATION

(Regd.)

- ***Easy to operate***
- ***Gives extra wide spread***
- ***Provides greater aeration***
- ***Flexible to any undulation***
- ***Gives even distribution***
- ***Quick acting couplings***
- ***Operates at lower pressure***

NUNAN ASSURES PRODUCTION AND DOUBLES YIELDS

Graziers will agree that lucerne, "The King of Fodders," is the ideal crop for grazing or fodder conservation purposes. In most areas where lucerne grows water is the limiting factor and the number of cuts per year generally depends on the rainfall or the use of irrigation.

Flood irrigation may often be a very costly investment. Costly from the viewpoint of levelling, grading and ditching and mainly in regard to the amount of water used. Loss of water by evaporation and seepage along channels is eliminated when NUNAN IRRIGATION is used.

NUNAN is very adaptable to undulating country too and levelling for even distribution is not necessary.

Contact our Local Agent who will arrange for our District Representative to call and make a survey of your irrigation possibilities.

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INSECT PESTS.

Notes contributed by the Entomological branch.

GREEN PEACH APHID.

(*Myzus persicae.*)

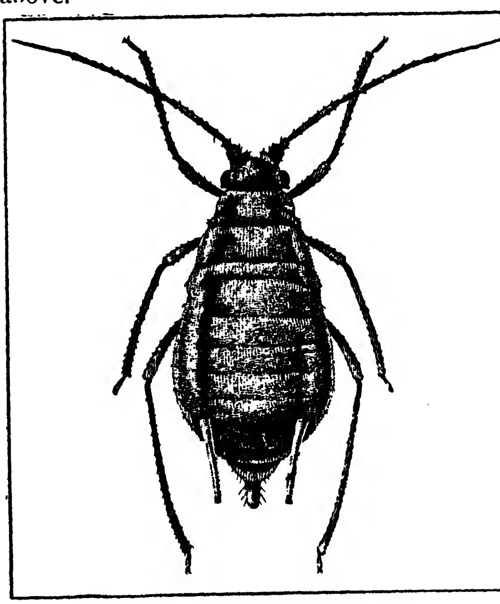
THE green peach aphid has been recorded, in some seasons, as a serious pest in the main peach- and nectarine-growing districts of New South Wales. Infestations in the inland districts tend to be more severe than those experienced in the coastal areas. The trees are injured during spring and early summer, and, where severe infestations occur, the leaves and blossoms become distorted, shrivelled and finally die. A large proportion of the blossoms may fail to set fruit or the young fruits which do set do not develop to any extent and usually drop early in the season. When the leaves are largely destroyed, "die-back" of lateral growth is common.

Life History.

Egg-laying generally occurs only in the colder districts and eggs are, therefore, rarely seen in the warmer coastal areas. The minute eggs, which measure about one-fiftieth of an inch in length, are pale green when first laid, but after two or three days become shining black. They are deposited on the peach and nectarine trees, mainly about the bases of the buds, by the wingless egg-laying females, during May to mid-July. Eggs are often deposited on other stone fruit trees, such as apricots, almonds and cherries, but serious infestations do not develop on these trees, though normal hatching occurs.

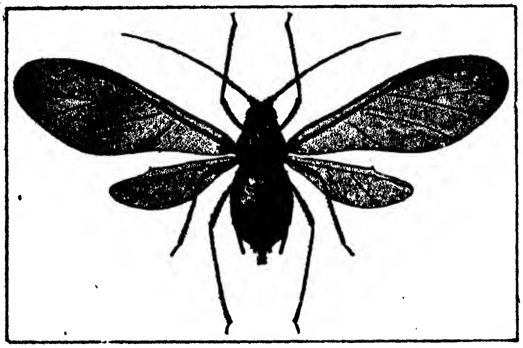
About the end of July or early August the eggs hatch and minute wingless aphids appear. Hatching is usually complete by mid-August, but some variation may occur from season to season and in the various localities infested. These young aphids remain on the trees, commence feeding on the bursting buds and grow in size but do not commence to reproduce until the buds have burst. They then produce enormous numbers of living young, which in turn mature and so give rise to several generations. The wingless adult aphids vary in colour from green to pale yellow or pink, and the later developing winged forms are green with darker markings.

The spring generations of aphids are wingless, but in the early summer winged forms are produced which migrate from the peach trees to various weeds and cultivated plants. The aphids live mainly on these secondary host plants throughout the summer and autumn, and in the late autumn winged forms fly back to the peach trees. Winged females then give rise to a generation of wingless females which mate with the winged males from the secondary host plants and egg-laying again commences, thus repeating the seasonal cycle described above.



Wingless Female of the Green Peach Aphid.

The main plants known to serve as secondary hosts for this aphid in New South Wales are artichoke, Cape weed, dock, dahlia, Iceland poppy, pea, potato, rose, spinach, sow thistle, tomato, trumpet flower, cabbage, cauliflower and radish.



Winged Female of the Green Peach Aphid.

Control.

Control measures have been developed along two distinct lines, namely, dormant sprays for the killing of eggs (ovicidal), and contact sprays timed to kill the young aphids after hatching is complete and before further development occurs. Contact sprays are applied during the semi-dormant period at late bud-swell, usually mid- to late August, depending on the locality.

Dormant Sprays.

As the name suggests, these sprays should only be applied when the trees are fully dormant, usually during the latter half of July. *On no account* should such sprays be applied when the buds have commenced to swell, otherwise injury may follow.

A single, properly-timed and thorough application is sufficient to control this aphid in districts where overwintering eggs are laid.

Tar Distillate Spray.—A dilution of one in forty with water, if applied thoroughly, will give complete control of overwintering eggs and prevent any hatching. A more concentrated spray should not be used as burning of the buds, even during complete dormancy, may follow such an application.

Tar distillate exerts little or no control of scale pests and, in fact, its continuous use appears to stimulate the development of San José scale. There is some evidence that tar distillate sprays have some fungicidal action against peach leaf curl, but are not by any means as effective as Bordeaux mixture or lime-sulphur.

DNC-Oil.—This spray is also diluted one in forty with water, and applied during the fully-dormant period.

DNC-oil, in addition to killing aphid eggs, will also give good control of San José and prune scales, and is to be preferred if scale control is a problem.

Semi-Dormant Sprays.

These sprays are essentially contact sprays and must be applied after the eggs have hatched and before the buds burst in the spring.

Nicotine sulphate (*Black Leaf* 40).—This insecticide is used at the rate of 1½ pints to 100 gallons (1 in 600) and should always be applied when calm and preferably mild to warm conditions prevail. Nicotine sulphate is most effective in alkaline mixtures, and may conveniently be mixed with Bordeaux mixture, or lime-sulphur. White oil 1 gallon, or soft soap 4 lb., may be mixed

Leaves Infested with Aphids Showing Curling.

with every 100 gallons of nicotine sulphate spray, and either of these mixtures may be safely used during the growing period.

DDT Emulsion.—DDT emulsions have proved to be the most effective contact

sprays. Water dispersible powder forms of DDT have not given generally satisfactory results.

DDT should be used at a concentration of 0.1 per cent., *i.e.*, a 4 per cent. emulsion is diluted 1 in 40, or a 25 per cent. emulsion 1 in 250 (3 1/5 pints per 100 gallons). DDT in some forms is compatible with Bordeaux mixture and lime-sulphur, and the directions of the manufacturer concerned should be followed.

Left.—Infested Twigs *Right.*—Uninfested.

HETP (*Hexaethyl tetraphosphate*).—This is a new organic phosphate insecticide which has given most satisfactory control of this aphid. It is effective at cool as well as fairly high temperatures. Unlike nicotine sulphate, it is not compatible with alkaline materials such as Bordeaux mixture, lime-sulphur, lime-casein spreader, etc., and for that reason the spray vat should be thoroughly cleaned out before using this insecticide. In addition, HETP breaks down quickly once mixed with water, and spraying should not be delayed once the spray vat has been filled with the mixture. HETP is used at a concentration of 1 in 1,600 (½ pint to 100 gallons), and the addition of a neutral wetter or spreader is recommended.

Combined Sprays.

Where it is necessary a combined fungicidal and aphicidal spray may be applied during the delayed-dormant period. Lime-sulphur or Bordeaux mixture may be combined with nicotine sulphate and some forms of DDT, but in such mixtures soap must not be included. HETP, which is a very satisfactory substitute for nicotine sulphate, cannot be used in combination with the commonly used fungicides, Bordeaux mixture or lime-sulphur.

Delayed Spraying.

Where winter control has not been undertaken or where eggs have not been deposited, as on the coast, contact sprays should be applied during the delayed-dormant period. In some seasons, weather conditions are against effective spraying at this period, so that a heavy aphid population may build up after bud-burst, and treatment during spring and early summer may be desirable.

Hitherto spraying with nicotine sulphate has been suggested but it has always been made clear that spraying for this aphid when leaves have commenced to curl and so shelter the aphids has been a more or less unsatisfactory alternative. DDT and particularly HETP may both be used during the growing period with a considerable measure of success. Even with these new materials, it is pointed out that more effective and economical control may be obtained by spraying during the semi-dormant period before the aphid population has built up to any degree and before shelter such as curled leaves is available.

Peach Leaf Showing Autumn Migrants, Winged Males and Wingless Egg-laying Females.

Spraying Suggestions.

Thorough spraying, at the correct stage, is essential to obtain effective control of either winter eggs or living aphids irrespective of the type of spray selected. In order to obtain a thorough coverage good pressure (250-300 lb. per square inch) and discs giving a coarse drenching spray are essential. Particular attention must be paid to the spraying of laterals, especially towards the tips of the trees. Naturally the most effective cover can be applied during calm conditions and every effort should be made to take advantage of suitable spraying weather.

USE OF DDT FOR THRIPS ON TOMATOES

In the Metropolitan Area.

EFFECT ON INCIDENCE OF SPOTTED WILT.

G. PASFIELD, B.Sc.Agr., Entomologist.

THE Wentworthville district has long been regarded as one of the worst in the Metropolitan Area for tomato spotted wilt infection and growers, in the northern section particularly, regard the growing of early tomatoes as impracticable.

In an experiment conducted at Wentworthville last season to ascertain the efficiency of DDT and benzene hexachloride against a number of tomato pests, DDT sprays resulted in a lighter infestation of thrips and a significant reduction of infection of spotted wilt.*

Because earlier coastal experiments in the use of DDT and benzene hexachloride on tomatoes had given promise of improved control of tomato caterpillar,† aphids, stem borer and thrips, and because little experiment work had been done in the outer Metropolitan Area, an experiment was carried out with these insecticides on early tomatoes at Wentworthville in 1947.

On 15th October 800 Grosse Lisse tomato plants were planted out, and the experiment was commenced on 20th October.

The treatments were:—

1. 0.1 per cent. DDT-solvent naphtha emulsion.

2. 0.1 per cent. DDT dispersible powder spray.

3. 2 per cent. DDT-kaolin dust.

4. 2 per cent. (0.26 per cent. isomer) benzene hexachloride-kaolin dust.

5. Untreated.

The experiment was arranged in four randomised blocks, with thirty-three plants per plot. The treatments were applied three times per week.

Within ten days of the commencement of the experiment, the two dust treatments had to be eliminated because of the severe injury caused to the foliage of the young plants. The injury first manifested itself in the blocks treated with benzene hexachloride.

The infestations of caterpillars, aphids, stem borers and mites were nil or very light, and it was apparent, as the experiment proceeded, that very little data would be obtained on the pests.

Thrips tabaci (Onion thrips) were, however abundant as adults on untreated tomatoes, but the infestation was much lighter on the treated plants as a whole. The thrips were also observed to be very numerous and breeding on nearby crops of cabbages, potatoes and on weeds such as lamb's tongue and curled dock.

Spotted Wilt Infection.

It was noted that the incidence of spotted wilt disease of tomatoes varied in the different plots, and it was apparent that the number of infected plants was much lower in the plots treated with 0.1 per cent. DDT-solvent naphtha emulsion.‡ Only 7.5 per cent. of plants treated with 0.1 per cent. DDT-solvent naphtha emulsion three times per week became infected, as compared with 32.5 per cent. infection of plants sprayed with the 0.1 per cent. DDT dispersible powder treatment and 75 per cent. infection of untreated plants. Thus the 0.1 per cent. DDT-solvent naphtha emulsion treatment was significantly more effective

* These results do not justify a recommendation of DDT spray for the control of spotted wilt but growers may be interested to try out 0.1 per cent. DDT-solvent naphtha emulsion applied three times a week commencing at the seed-bed stage.

† Tomato caterpillar (*Heliothis armigera*), tomato aphids (*Macrosiphum solanifolii*), tomato stem borer (*Gnorimoschema plaesiosema*).

‡ In previous experiments carried out by Departmental officers some degree of control of tomato spotted wilt was obtained by the use of a number of insecticides, including DDT, but 0.1 per cent. DDT emulsions applied at weekly intervals did not show much, if any, improvement on the recommended tartar emetic-sugar bait treatment.

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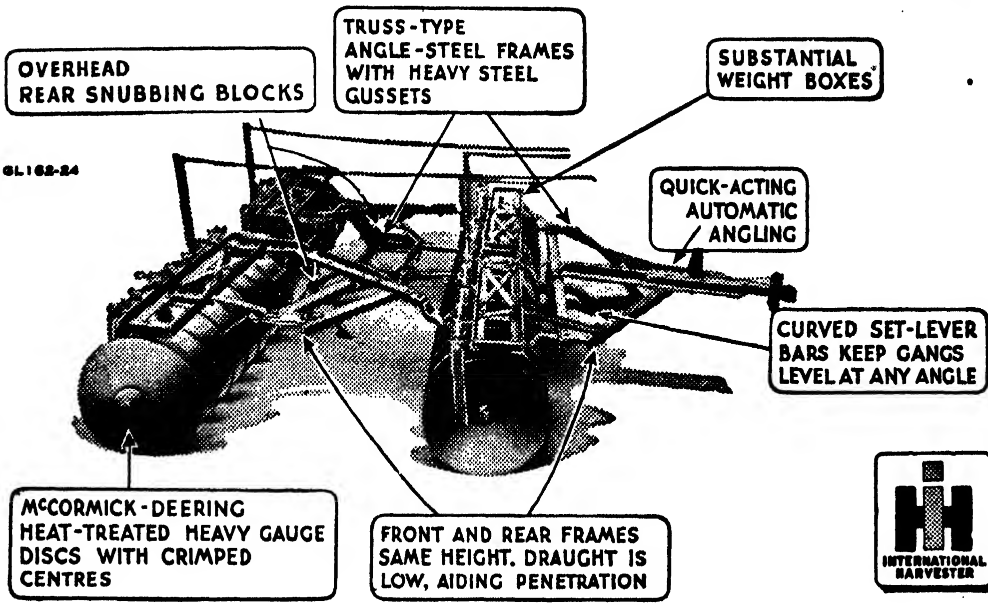

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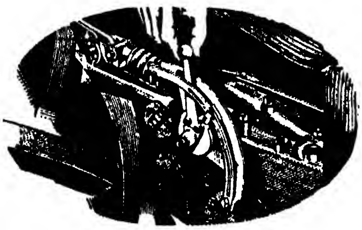

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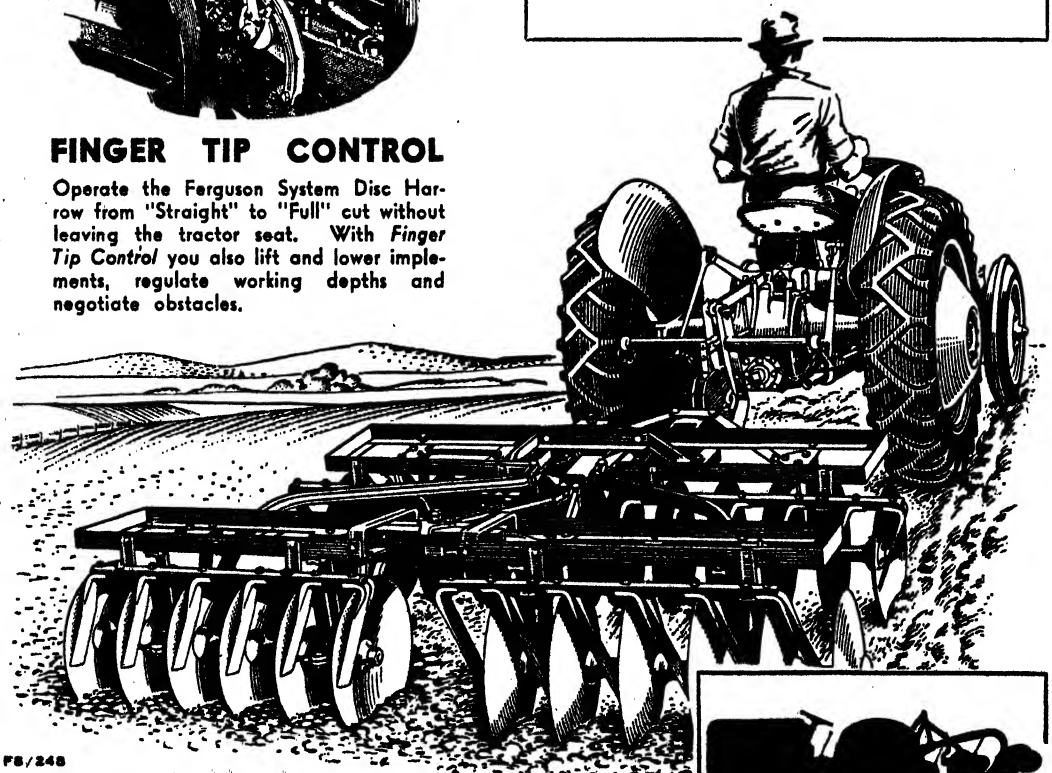

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than the 0.1 per cent. DDT dispersible powder spray treatment, and both treatments caused a significant reduction of infection compared with the untreated plots.

Two peak periods of spotted wilt infection occurred—during the second weeks of both November and December.

Thrips taken from the tomato plants during the experiment were identified as *Thrips tabaci,* the accepted vector species, except for one *Haplothrips victoriensis.*

The season was unusually wet, and since continued and heavy rainfall reduces *Thrips tabaci* populations it is possible that spotted wilt of tomatoes may not have been as bad in the 1947 season as in some others. However, 75 per cent. loss of untreated plots, buffered by treated plots, indicates that the infection rate was quite heavy.

The DDT-solvent naphtha emulsion improved the appearance of the plants by making them appear more fresh and giving them a deeper green colour. The DDT-dispersible powder spray caused a hardening of the foliage and retarded growth of the plants.

The DDT-dispersible powder spray did not leave a satisfactory, even cover over the leaves, and deposits tended to collect at the ends of the leaves due to run-off. The DDT-solvent naphtha emulsion, on the contrary, left an even deposit of crystals over the leaves after evaporation.

DDT Residues.

Using the dehydrohalogenation method of estimating DDT residues, it was found that samples of tomatoes from plants which had been sprayed three times per week with 0.1 per cent. DDT-solvent naphtha emulsion had a DDT residue of 5.5 parts per million when harvested.§

Acknowledgment.

I wish to acknowledge very gratefully the services rendered by Messrs. J. S. and L. Klippert of Wentworthville in making available the land, cultivating the crop, and generally assisting in carrying out the experiment.

§ Analysis by D. O'Neill of the Chemist's Branch.

Hardfacing of Ploughshares Greatly Increases Their Life.

Trial at Hawkesbury Agricultural College.

A TEST recently conducted at Hawkesbury Agricultural College showed that a considerable increase in the life of ploughshares can readily be obtained by comparatively low cost hardfacing.

In actual ploughing tests hardfaced shares gave an acreage 8½ times greater than untreated shares for an additional cost of less than half the original cost of the shares.

The practice of hardfacing wearing parts of farm machinery, widely used in America by primary producers to reduce costs, is only now being adopted in this country. Hardfacing by oxy acetylene or electric arc welding is simple in application and can be undertaken by garages, engineering shops or primary producers equipped with the necessary plant.

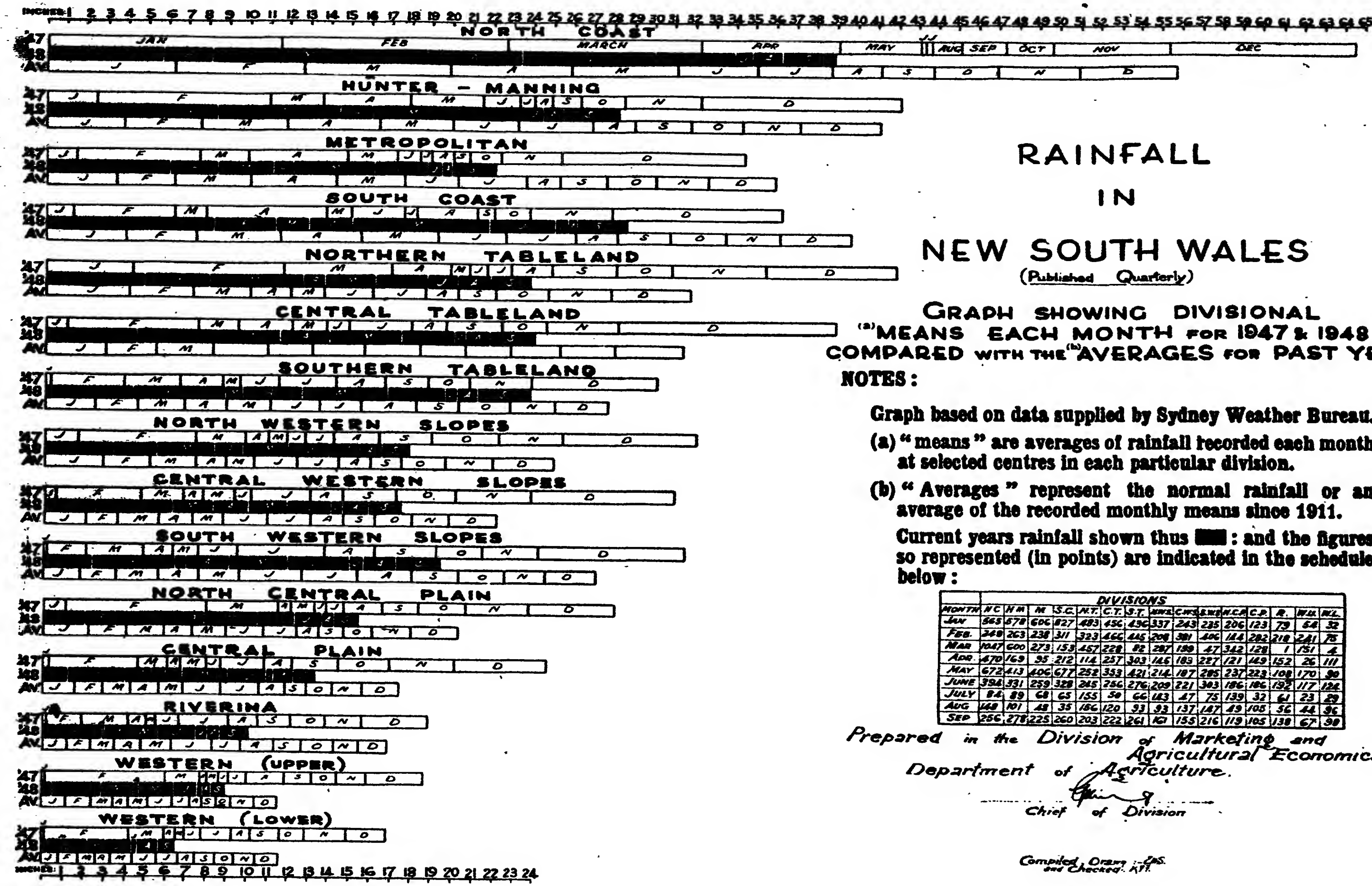
In the Hawkesbury College test Cobalide 1, an Australian-produced hardfacing alloy rod which has extreme abrasion resistance, was used, being supplied by Commonwealth Industrial Gases Ltd. An area ¾ inch wide and ⅛ inch thick was oxy acetylene welded along the wearing surface and point of a 10-inch share.

The test was a severe one, the land used being extremely hard dry white pipeclay overlying ironstone gravel, which would not normally have been ploughed. Three single-furrow ploughs were used.

The untreated shares did not last more than 2½ days, whereas the Cobalide 1 hardfaced shares lasted for 21 days. Even then the only wear was at the rear of the point, the actual length of the hardfaced shares being practically the same after as before use, so that by a second hardfacing of this area a further considerable saving could be effected.

The initial cost of the ploughshares tested was 19s., and the total cost of the hardfacing including labour, gas and Cobalide rod was approximately 8s.

Such increases in the wearing life as resulted in these field tests at Hawkesbury Agricultural College, indicate that the efficiency of tillage implements such as ploughs, cultivators, combines, seed drills, rotary hoes, harrows, etc., should be increased considerably by hardfacing in this way and the farmer thus enabled to effect considerable saving in the cost of replacement parts.



RAINFALL IN NEW SOUTH WALES

(Published Quarterly)

GRAPH SHOWING DIVISIONAL (a) "MEANS" EACH MONTH FOR 1947 & 1948 COMPARED WITH THE (b) "AVERAGES" FOR PAST YEARS

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "Averages" represent the normal rainfall or an average of the recorded monthly means since 1911.

Current years rainfall shown thus ███ : and the figures so represented (in points) are indicated in the schedule below:

MONTH	DIVISIONS														
	N.C.	H.M.	M.	S.C.	N.T.	C.T.	S.T.	N.W.S.	C.W.S.	S.W.S.	N.C.P.	C.P.	R.	W.U.	W.L.
JAN.	565	578	606	827	483	456	436	337	243	235	206	123	79	54	32
FEB.	348	263	238	311	323	466	445	208	381	406	124	282	218	241	75
MAR.	1047	600	273	153	457	228	82	287	199	47	342	128	1	151	4
APR.	470	169	95	212	114	257	303	145	183	227	121	149	152	26	111
MAY	672	413	406	677	252	353	421	214	187	285	237	223	108	170	90
JUNE	394	331	259	328	245	256	276	209	221	303	186	186	192	117	124
JULY	84	89	68	65	155	50	66	183	47	75	139	32	61	23	29
AUG.	148	101	48	35	166	120	93	93	137	147	49	105	56	44	96
SEP.	256	278	225	260	203	222	261	161	155	216	119	105	138	67	98

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

Chief of Division.

Compiled, Drawn and Checked.

POULTRY NOTES

THE CULLING SEASON.

E. HADLINGTON, Principal Livestock Officer (Poultry).

AT this time of the year the subject of culling hens is usually given consideration. However, under present conditions heavy culling would not be justified in the majority of cases. Having regard to the necessity for exporting the maximum number of eggs to Britain, all hens which are laying normally should be retained.

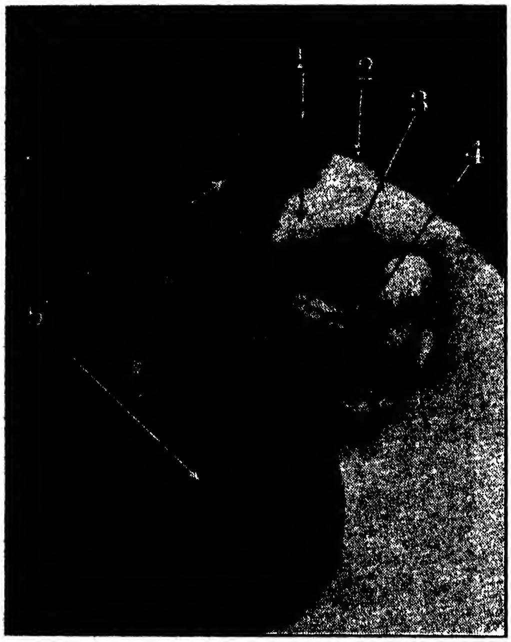
On farms where flocks are properly managed and birds correctly fed, there should be no necessity for wholesale culling until after the end of the year, and then the culling should only be of second-year hens. During November and December, production should be about 50 per cent., with a gradual reduction after that time. In cases where production has fallen below 50 per cent., consideration should be given as to whether this may be due to some fault in the management, housing, or feeding of the birds, which would account for lowered production. If, upon checking these points, no reason can be found for the reduction, it is advisable to commence culling the poor producers.

Under the heading of management faults would come such items as overcrowding, irregularity in feeding, infestation by parasites, inadequate nesting accommodation, unsatisfactory water supply and improper handl'ng of broody hens in the case of heavy breeds.

Feeding Faults.

Many feeding mistakes are made by beginners, with the result that production falls below normal expectations. One of the worst fallacies is that the hens might become too fat if they are given as much food as they will consume. Consequently the amount of food given is reduced and the birds gradually become hungrier, and in a short time production falls rapidly. In such cases, the best layers are among the first to cease laying, as they require more feed to maintain production. In cases where a wet mash and grain method of feeding is adopted, the only course is to give the birds as much as they will consume within about an hour of feeding time, and where a dry mash and grain system is followed, the dry mash hoppers should be left open to the birds during the day, and sufficient grain should be given in the afternoon to satisfy the appetites of the birds, without leaving any after about an hour. If a supplementary feed of wet

mash is given as well as dry mash, it is preferable to give only half the normal quantity and then allow the birds to satisfy their requirements with the dry mash. However, if the birds are raised on dry mash from the time they are chickens, there is little to gain by feeding wet mash as well.



Head of Poor Layer (White Leghorn).

Showing characteristics denoting coarseness—

1. Skull deep above the eyes.
2. Skull wide across the top.
3. Sunken eye with overhanging brow.
4. Feathery face.
5. Comb and wattles coarse in texture.

Palatability of the ration must also be considered. In cases where dry mash is fed it is advisable to add 10 to 15 per cent. of ground grains in conjunction with pollard, bran and meat meal, etc., to improve the texture.

Faults in Housing.

Some of the many housing faults which are likely to affect production at this time of the year are poor ventilation, over-crowding and perches too close together. During the cooler weather such faults would not affect production to the same extent as in the warmer weather, but from now onwards particular attention should be given to these points. Houses for layers should be open in front and have a wide aperture along the roof at the back to ensure good ventilation and the perches should not be less than 20 inches apart with a height of 20 inches from the floor. To avoid over-crowding, an allowance should be made for at least 7 inches of perching space per bird; this works out at roughly 30 feet of perching for each fifty birds. By allowing 20 inches between the perches the free circulation of air between the rows of birds is ensured, and over-crowding on hot nights is avoided. Any over-crowding through the summer is likely to result in early moulting.

Head of Poor Layer (Heavy Breed).

1. Skull deep above eyes.
2. Skull wide across top.
3. Sunken eye with overhanging brow.
4. Feathery face.

If after having checked over the points outlined above no reason can be found for below normal production, culling should be proceeded with.

Culling Procedure.

Having decided that culling is necessary, a definite procedure should be followed. Pens of birds which are not laying up to expectations should be closed in, and any birds which are showing dryness in the comb, or very coarse in the head, should be handled to check the condition of the

abdomen. In the case of birds which have ceased to lay, the pelvic bones will be close together, and the whole of the abdomen will be contracted.

When handling heavy breeds or cross-breds, allowance must be made for hens which have been broody and have not come back into production. Where any large numbers have been put back into the pens, they should be given a chance to resume production before resorting to heavy culling, and where there is any doubt about the matter it is advisable to place the birds in a pen for a few days to see if they come on to lay again.

Distinguishing Good from Bad Layers.

The birds which are in full laying condition will be well fleshed and fairly heavy, the comb will be fresh and soft in texture, the eyes will be large and prominent, showing alertness and evidence of good health, the face smooth and free from undue feathering, the skull will be moderately fine and the neck fairly thin and long.

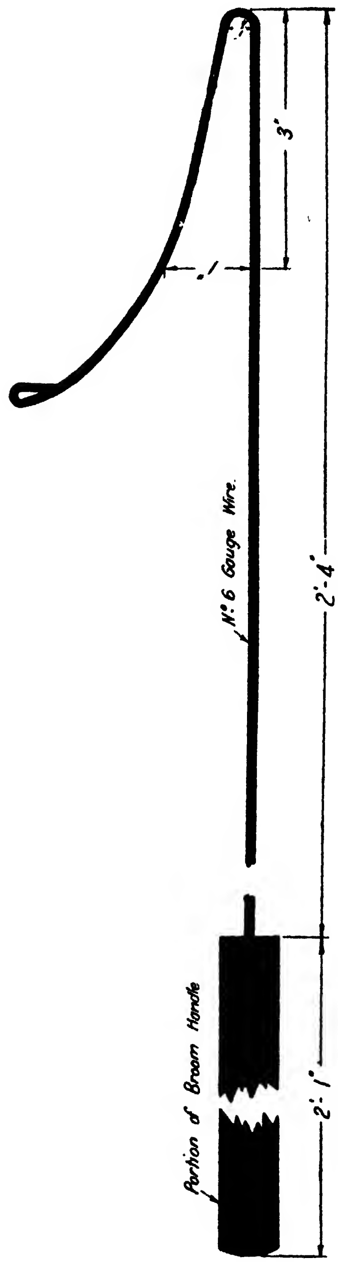
Frequently, after a long period of laying, the best layers become bald-headed, *i.e.*, they lose the feathers from the top of the head. Such birds are usually docile and always ready for their food. They will forage and scratch even though given all the food they require. They will retain their weight and will often lay while moulting. On the other hand, poor layers are lazy, lack interest in their surroundings and do not have the alert character of the good layer. The eyes are small and sunken and the face wrinkled and feathered with over-hanging eyebrows.

There are also the weak types which although not showing any coarseness, are poorly fleshed, and have a sallow appearance, entirely lacking in character. The "crow headed" types with long thin faces also come within this category.

Birds which are very poor in condition and obviously in ill-health are useless for marketing and should be killed and burnt.

Culling First-year Birds.

Apart from culling out the hens which have finished their second laying season, it may be necessary to cull a few of the first-year birds after the end of the year. It will usually be found that more culling is necessary among heavy breeds than in light breeds, as the heavy breeds are more inclined to develop coarseness after their first year of laying. However, usually not more than 5 to 10 per cent. of a normal



Details of Useful Catching Hook.

flock of first-year birds would require to be culled. These would be culled for the same reasons as outlined for second-year

birds. In addition, any first-year birds which commence to moult before the end of the summer should be eliminated, as they are not likely to come back into production for several months at least, and it would not pay to keep them for another flush-laying season.

Pelvic Bone Measurements.

In the culling of hens, either first or second-year, also pullets, too much importance should not be placed upon the width apart of pelvic bones as an indication whether the birds are good layers or not. It should be realised that as the birds cease to lay, even temporarily, the whole abdomen contracts and the bones close up, and thus this condition is only an indication as to whether the birds are actually laying or not. The condition of these bones should therefore not be relied upon to determine which are the best layers. When a hen or pullet is in full lay the space between the pelvic bones will be about 1½ to 2 inches, whereas in the case of a bird which has ceased to lay, the bones may only be about ½ inch apart. The thickness of the pelvic bone is some indication of the productive capacity of a bird, as it will usually be found that when a bird has thick pelvic bones covered with gristle, she is a heavy, coarse type, which cannot be expected to lay consistently.

Facilities for Culling.

On many poultry farms no proper facilities are available for culling the birds, and consequently regular culling is not carried out, as it should be, from month to month, to maintain payable production.

All houses should be fitted with doors so that the birds can be shut in at any time desired, and the doors should be placed in such a position that the birds can be driven along a fence to the door when it is desired to shut them in during the day time. If the doors are fitted at the corner of the house where there is no fence, it is most difficult to induce the birds to go in and this necessitates the services of several people to drive them in.

A wire-catching hook is also a decided advantage but some practice is required in order to become expert in its use. A suitable hook can be made out of No. 6 or No. 8 gauge fencing wire fitted securely into a length of broom handle to enable it to be gripped firmly. The dimensions of a suitable hook are shown in the illustration.

Bush Fire Danger.

Conditions Prescribed Under Careless Use of Fire Act.

THE Chief Secretary, Mr. Baddeley, states that on the recommendation of the Bush Fires Advisory Committee conditions have been prescribed under the Careless Use of Fire Act for observance by persons using or causing to be used any tractor, engine or engine operated machine, truck or lorry, in or across grass, crop or cereal stubble lands. Such persons are required to:—

(1) Within a period of 28 days before the beginning of harvesting operations, remove all surplus internal carbon.

(2) Within a period of 7 days before the beginning of such harvesting operations, remove all other inflammable matter and thereafter at such times during the harvesting or carting operations as may be required to ensure reasonable safety against fire.

(3) (*a*) Fit safety guards so designed and constructed as to protect exhaust pipes, manifolds, spark arrestors and other heated areas capable of causing fires and air-cooled engines from contact with grass, hay, crops, stubble or other inflammable matter;

(3) (*b*) Fit a knapsack spray pump filled with water or a hand chemical fire extinguisher or two fire beaters and two empty grain sacks or other fire-fighting appliances.

(4) Maintain in good order and condition manifolds, exhaust pipes, expansion chambers and the joints thereof so as to prevent a fire being caused thereby.

These conditions operate from the 1st November, 1948, until 31st March, 1949, and apply to the whole of the State.

Any person failing to comply with the above directions is liable to a penalty not exceeding £100 or to be imprisoned for any period not exceeding one year or to both such penalty and imprisonment.

Mr. Baddeley also reminds the users of tractors, harvesters and portable engines that the law requires the fitting of spark arrestors of an approved type.

"The conditions prescribed merely embody simple and practical precautions and are designed to protect the harvest from losses by fire," concluded Mr. Baddeley.

Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Guernseys)	46
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	62
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ..	30
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ..	121
Hawkesbury Agricultural College, Richmond (Jerseys)..	107
Hicks Bros., "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., "Nundi," Tarcutta (Red Poll)... ..	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead" Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)..	49
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	103
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	75
Salway, A. E., Cobargo (Jerseys)	57
Scott, A. W., "Milong," Young (Aberdeen-Angus) ..	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)..	170
Von Nida, F. E., Wildes Meadow...	30
Wagga Experiment Farm, Wagga (Jerseys)	69
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	23
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm (Jerseys)	89
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	50
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale ..	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Gladesville Mental Hospital	7
Kenmore Mental Hospital	58
Mt. Penang Training School, Gosford	34
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	69
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief of Division of Animal Industry.

New Government Experiment Farm.

To be Established at Tamworth.

"THE State Government has approved establishment of an experiment farm at Tamworth, at an estimated cost of £32,000."

In making this announcement, the Minister for Agriculture, Mr. Graham, said that north-western New South Wales was one of the few regions in the State without an experiment farm for research and investigation into local agricultural problems.

The site selected for the new farm adjoined the Farrer Memorial High School and there would be close co-operation between the Department of Agriculture and the Department of Education, which should be of considerable benefit to students.

Mr. Graham said that in the absence of an experiment farm in the north-west, the Department of Agriculture had not been able to undertake any widespread field research or investigational work in those districts. At present there were no adequate facilities for experiments in relation to the breeding, raising or fattening of stock or for the investigation of cultural problems arising from the climatic conditions and soils peculiar to the north-west.

Dealing with the immediate objectives of the experiment farm to be established at Tamworth, Mr. Graham said that there were still many improvements which could be effected by the breeding of new wheats. Production of "winter" wheats was at present a major objective which, if realised, should be of considerable value to wheat farmers and stock raisers throughout the northern part of the State.

There is need for research into many aspects of pasture improvement, including lucerne and native pastures. On the animal side, so impressed have I been with the future for fat lamb production in the north, that the Government has agreed to the building of a country killing works at Gunnedah. Tamworth Experiment Farm will investigate all aspect of fat lamb production in the north. In addition, it will turn its attention to raising the standard of efficiency in the pig, poultry and agricultural industries."

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm Bathurst.
Boardman, C. O., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B. Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Protection of Wild Flowers and Native Plants.

THE Minister for Local Government (Hon. J. J. Cahill) has issued a warning that it is an offence against the law for persons to pick protected wild flowers and native plants growing on any Crown land or State Forests, or on any public park or public reserve, or on any private land without the permission of the owner. The protected list of wild flowers and native plants includes most of the flowers and plants commonly met in the bush.

The police, he said, were keeping a strict watch, and many honorary rangers had been appointed in all parts of the country to assist in seeing that the law in regard to the protection of wild flowers and native plants was observed.

Mr. Cahill also directed attention to the Regulations under the Wild Flowers and Native Plants Protection (Amendment) Act, 1945. These Regulations, he stated, provided for the granting of growers' licences to the owners or lessees of land, who were required, when selling the flowers, to affix to each bunch a label clearly indicating the name and address of the grower, and his licence number. The practice whereby persons formerly sold the flowers picked from private property under permit from the owner or lessee was now a contravention of the Act, except in the case of Christmas Bush. Mr. Cahill asked that members of the public co-operate in the enforcement of the law, by seeing that bunches of protected wild flowers, other than Christmas Bush, purchased by them, carried the label of the licensed grower.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.)	120	13/11/48
Bradley, H. F., "Nardoo," Ashford Road Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	297	9/6/49
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	74	2/2/49
Limond Bros., Morisset (Ayrshires)	66	15/7/49
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R. "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	49	8/5/49
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Richardson, C. E., Kayuga Rd., Muswellbrook (Jerseys)	94	27/10/48
Rowntree, E. S., "Mourable," Quirindi (Jerseys)	75	21/7/49
Scott, A. W., "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	67	26/4/49
Yanco Experiment Farm (Jerseys)	91	14/10/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle	51	20/4/49
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Burns, R., "Wilga Glen," Coonamble	20	24/12/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell	33	28/7/49
Coventry Home, Armidale	11	29/9/48
Daley, A. E., "Siton," Oakwood Rd., Inverell	14	14/5/49
Daley, A. J., Lealands, Inverell	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell	34	5/4/49
Emu Plains Prison Farm	141	23/4/49
Fairbridge Farm School, Molong	33	9/4/49
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	27/4/49
Frizelle, W. J., Rosentein Dairy, Inverell	111	9/9/48
Genge, G. L., Euston, Armidale	36	22/9/48
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood	24	10/5/49
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	34	22/9/48
Ince, W. G., Kirkwood St., Armidale	11	12/4/49
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	34	22/9/48
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	17/6/49
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	40	20/11/48
McCosker, E., "Bannockburn Station," Inverell	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood	31	13/8/49
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
McMillan, N., Duval Road, Armidale	30	29/9/48
MacNamara, B., "Mount View," Cessnock	67	21/5/49
Marist Bros. College, Campbelltown	82	23/1/49
Mason, A., Killarney, Armidale	33	30/9/48
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Mullholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	28	15/12/49
Police Boys Club, Kurrajong	12	5/7/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
Rolfe, A. E., "Avon Dale," Inverell	22	14/5/49
Rowlands, F. C., "Werribee," Waugoola	35	23/8/49
St. Ignatius' College, Riverview	24	6/9/49
St. John of God Training Centre, Kendall Grange, Lake Macquarie	8	12/7/49
St. John's Hostel, Armidale	6	24/6/49
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills	29	11/6/49
St. Patrick's Orphanage, Armidale	12	29/5/48

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
St. Vincent's Boys' Home, Westmead ...	30	9/7/49
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	54	5/4/49
Tanner, F. S. Dural Rd., Armidale	28	30/9/48
Tombs, E. S., Box 76 P.O., Armidale ...	33	30/9/48
Tombs, P. C., Kellys Plains, Armidale ...	49	29/9/48
Tombs, R., Harlwood, Armidale	40	22/9/48
Tosh, W. K., "Balgownie," Armidale ...	12	30/9/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48
Von Frankenberg, F. E.. "Spring Hills," Camden	68	12/12/48
Waddell, W., "Afton," Oakwood Rd., Inverell	127	5/7/49
Waters, A., Marsh Street, Armidale	2	13/10/48
Watson, F. J., Golf Links Rd., Armidale ...	3	7/10/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., "Birida," Armidale ...	39	12/4/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Budding Pome and Stone Fruit Trees.

BUDDING, as a method of working trees and stocks to the variety desired, has largely supplanted grafting, as it is found to be simple and economical—simple, because it requires very little skill and practice to perform, and economical, inasmuch as the operation consists in applying a single bud to the surface of the growing wood of the stock, while with grafting there are usually two or more buds used on every scion.

This is quite a consideration when wood of different varieties is scarce, and the nurseryman or orchardist wishes to make the greatest use of his supply.

The bud is inserted under the bark, and is applied directly to the cambium layer of the stock. Nurserymen use this means almost exclusively in working their young fruit-trees, as well as in working roses and many ornamental trees.

Budding is usually performed during the growing season, when the bark separates from the wood easily, and consists in taking a bud from one plant and inserting it under the bark of another.

There are three seasons, viz., spring, summer, and autumn, in which the operation can be carried out. By keeping the buds in cool storage until the trees break into growth almost any variety of fruit-tree can be successfully budded in the spring.

Summer buds may be put in as soon as the buds on the spring growth of wood are properly matured. This is about the beginning of December. Budding at this season, however, is not recommended, except, perhaps, for citrus trees and for peach trees.

When peach trees are budded in the spring or early summer the inserted bud can be started into growth very soon after it has taken, thus avoiding smothering by gum from the T cut, or injury from the grub of the peach tip moth.

Autumn buds, or, as they are more commonly called, dormant buds, are those inserted in February and March, which lie dormant all winter, breaking into growth in early spring. The following autumn they make exceptionally fine trees.

Autumn is the season most favoured for budding, as the young stock is by this time large enough to take buds, and the orchardist or nurseryman finds that he raises a better tree than that raised from a summer bud; nor has he to go to the trouble of keeping his buds in cold storage, as with spring buds, as he cuts them fresh every day or two as required. Budding is best done in fine weather, avoiding wet days.—DIVISION OF HORTICULTURE.

CLOVERS FOR MILK AND MEAT
ON THE SOUTHERN TABLELAND.

(*Continued from page* 583.)

W. D. Hardy, B.Sc.Agr., H.D.A.*

THE purpose of this article is to describe the ways in which clovers can be used for improving the protein-deficient pastures of the Southern Tableland—with a consequent increase in their value for milk production and fat lamb raising and a build-up of soil fertility.

In the first instalment (in November issue) the author discussed the economics of this form of pasture improvement; as well as management technique essential to maintenance of leguminous pastures in this area.

In this issue the utilisation of Subterranean clover in Southern Tableland pastures is described in detail.

Subterranean Clover
(*Trifolium subterraneum.*)

Subterranean clover is the most widely grown legume on the Southern Tableland; in fact, it can be safely claimed that Subterranean clover and superphosphate form the basis of all pasture improvement work throughout this area.

The more important reasons for the popularity of this species are set out in the following paragraphs:—

Climatic conditions are ideal for its growth and development. Subterranean clover requires a cool climate for best results, but of greater importance still is the amount and incidence of the rainfall. Good rains are required in autumn, winter and spring, Generally speaking, the rainfall during these periods on most parts of the Southern Tableland is more than adequate for excellent growth of Subterranean clover. In localities such as the Cooma Plains area, where the total rainfall is low (19-20 inch average) and the autumn and winter incidence is bad, conditions are not ideal for good clover growth; in spite of this, however, Subterranean gives slightly better results than the natural legume, which in this case is Woolly Burr Trefoil (*Medicago minima*). Once a clover stand in these borderline areas sets a good crop of seed enough "hard"-coated seeds are present in the ground to carry the stand over an unfavourable season.

* Mr. Hardy was, until recently, a District Agronomist with this Department, and was in charge of the Southern Tableland Area.

Perennial Rye Grass and Subterranean Clover at Kangaloon.

It is usually considered that for economic growth and development of Subterranean clover the rainfall during the April-October period should be at least 14 inches. At Crookwell, where this clover grows to perfection, the rainfall during this period is 22 inches.

A great proportion of the soils of the Southern Tableland are not sufficiently fertile to allow of the establishment of the better types of grasses such as perennial rye grass (*Lolium perenne*), Cocksfoot (*Dactylis glomerata*) and *Phalaris tuberosa*. Subterranean clover, with annual dressings of superphosphate, has proved an ideal means of rapidly and economically lifting soil fertility to a stage where the better-class introduced grasses will flourish. Generally speaking, this stage is reached in five or six years.

On the property of Messrs. C. E. and H. F. Prell at Crookwell, where an area of 5,000 acres has been under Subterranean clover for over twenty years, the carrying capacity has been raised from just under one sheep per acre to an average of two grown sheep, which cut approximately 13 lb. wool per head—in other words, 26 lb. wool per acre. All the sheep now carried on this property are stud Corriedales.

Subterranean clover is cheap and easy to establish; only 3 to 4 lb. seed per acre is required and a costly, well-prepared, seed-bed is not essential.

Once established, a sward of Subterranean clover will stand up to very heavy grazing and, due to its habit of burying its seed in the soil, it cannot be readily eaten out. It is also a very heavy seeder, and much of the seed or "burr" which remains on or near the surface of the soil provides excellent fodder for sheep during the summer when the clover plants are dead. Cattle fatten readily on the "burr."

As already mentioned, it is becoming a common practice to spread Subterranean clover about a property by grazing cattle on a well-seeded, dried off, Subterranean clover paddock for a few days and then turning the stock into the paddock where it is desired to establish the clover. This procedure is followed by "supering" in the autumn.

In a good season Subterranean clover makes an excellent sample of hay, most of the leafage being retained, and—providing a little care is taken and some form of chemical preservation is added, or the herbage is wilted a little prior to ensiling—an excellent quality silage can be produced.

Methods of Establishing Subterranean Clover.

Methods of establishing Subterranean clover applicable to the Southern Tableland are briefly described below.

Broadcasting 3 to 4 lb. of Subterranean Seed and 1 cwt. Superphosphate per acre among the Natural Pasture.—This method, however, is only recommended when large areas are to be treated and it is impracticable to cultivate or, where the terrain is too stony, or too much timber is lying about for the use of cultivation implements.

In light granite soils Subterranean clover can be successfully established by this method in the first year, but, generally speaking, on most soil types, up to three or four years longer are required with this method to establish a stand comparable to those established by one of the methods yet to be described.

Combining 3 to 4 lb. of seed into a sward of natural grasses, or, if a combine is not available, renovating the land once or twice and then broadcasting the seed and superphosphate over the surface. Harrows may then be used to obtain a better seed cover. Combining in or breaking the surface with a cultivator ensures that the seed is more or less sown in a seed-bed and, therefore, its germination and subsequent growth are not so likely to be interfered with by lack of rain or hot, drying winds.

The above method is widely used and is recommended unless it is desired to plough the land and take off a crop, such as oats.

Using oats as a cover crop for the Subterranean.—With this method 1 to 1½ bushels of oats is drilled into the soil, followed by broadcasting 3 to 4 lb. Subterranean seed and 1 cwt. superphosphate on the surface. The seed is then lightly harrowed in.

The crop affords excellent protection for the clover in the first year and in the second year the stubble provides the cover. It must be remembered that for best development, Subterranean clover requires some form of protection in the first year or two of its development. In the first two methods described this protection is provided by the grass sward.

When using oats as a cover crop for Subterranean clover it is preferable to graze the crop rather than cut it for hay. Often it has been found that with a heavy cover crop the clover plants grow up, seeking light, the clover seeds well above ground level and when the hay crop is removed the clover and seed are removed also. The result is that no clover comes away the next season.

Sowing Subterranean clover seed with a grass mixture, either on good or on poor soils.—This method generally involves the preparation of a seed-bed, but even so, it is widely used.

On fertile soils where the rainfall is adequate, *e.g.,* Robertson, Kangaloon, Moss Vale, Reidsdale, Adaminaby, Kybean and Cathcart areas, a mixture of Perennial rye grass 10 lb., Akaroa cocksfoot 3 lb., Red clover 2 lb., White clover 2 lb., and Subterranean clover (mid-season strain) 2 lb. per acre is used.

On fertile soils in areas where the rainfall is inclined to be on the low side for Perennial rye grass, *e.g.,* Crookwell, Taralga, Braidwood, Goulburn, Binda, Peelwood, Gunning, Yass, Queanbeyan, Canberra, Cooma, Berridale, Bungarby, Bombala and Delegate, Subterranean clover (mid-season strain) 3 lb. is sown with *Phalaris tuberosa* 3 lb. per acre.

Another commonly used mixture in these lower rainfall areas is Subterranean clover (mid-season strain) 2 lb., lucerne 4 lb., *Phalaris tuberosa* 1-1½ lb. per acre.

In some parts of the Tableland low-fertility, "hard-baked" soils carrying sparse vegetation are found. On these soils, due to the hard nature of the surface soil and the sparse covering of grasses, it is difficult to establish Subterranean clover by scattering seed, either with or without renovation. Such soils require severe working with a duckfoot cultivator and then sowing with a mixture of 3 lb. Subterranean clover and 3 lb. Wimmera rye grass or a mixture of Ball clover (*Trifolium glomeratum*) 2 lb., Subterranean clover 2 lb., Wimmera rye grass 3 lb. When sowing either Ball clover or mid-season Subterranean clover in such soils it is advisable to inoculate the seed.

The Strains of Clover Used.

Mt. Barber or mid-season strain of Subterannean clover is used almost universally throughout the Southern Tableland. Early-strain types do not appear to have a place in the pastures, but late-strain types such as Tallarook could be used more widely as a late hay proposition in centres such as Crookwell, Adaminaby, Nimmitabel, Bombala and Delegate.

Bacchus Marsh, a strain that is intermediate between early and midseason strains, has been tried during recent years, in one or two places, on the Southern Tableland and the results to date seem to indicate that this strain may be grown in preference to Mt. Barker. Although it flowers six to seven days before the Mt. Barker type, the yield from Bacchus Marsh appears to be greater. It is a strain well worthy of further trial.

A Pasture of Perennial Rye Grass, Subterranean and White Clovers at Adaminaby.
Three months from planting.

Subterranean clover seed is not harvested commercially on the Southern Tablelands, but with the excellent stands of heavy-seeding plants produced in most parts of the area, commercial seed production should be a payable proposition.

Just as the burr clovers or burr trefoils (*Medicago* spp.) have become naturalised on the slopes and near western plains divisions of New South Wales, so will Subterranean clover, in the near future, become naturalised on the Southern Tableland. Even now it is to be found growing well along many stock routes and stock reserves, and in many places on properties where neither seed nor superphosphate has been used. The rapidly expanding use of Subterranean clover on properties will hasten this process.

(To be continued.)

THE BUSINESS OF FARMING

PRICES : MARKETS : COSTS

Notes prepared each month by the Division of Marketing & Agricultural Economics.

F. A. O.

(Food and Agriculture Organisation.)

WHAT HAS IT DONE?

F.A.O. is the abbreviated title of the Food and Agriculture Organisation of the United Nations. Its official story began in May, 1943, when the representatives of forty-four countries were invited, on the initiative of the late President Roosevelt to the United Nations Conference on Food and Agriculture at Hot Springs, Virginia, U.S.A. The Conference faced the fact that at least two-thirds of the people of the world were undernourished and that many faced periodic starvation.

How bad is the world food situation? Before the war over half the world's population was receiving less than 2,250 calories per head per day, one-third received between 2,250 and 2,750, and only one-sixth received more than 2,750 calories. Calories measure the energy content of food and its use in the body. By comparison with the above figures an Australian farmer on a busy working day might consume and expend somewhere between 3,900 and 4,500 calories (the general Australian average daily intake is about 3,500).

What happens if human beings do not receive sufficient food? In the first place greatly reduced efficiency is experienced and it is impossible to work as hard as would be possible if adequate food was consumed. Also, energy previously stored in the body is drawn upon and unless adequate food is secured to halt the process, wasting and death eventuate. Death may not come immediately, but without sufficient food it is inevitable. Hence the high death rates and short expectation of life in so many countries. Deaths from shortage of food run into millions—even in the period since 1939.

Moreover, the war made conditions very much worse. Whole areas were "blacked out" as far as food production was concerned due to the military activities of opposing armies, and the necessity of putting manpower into the war machine. Perhaps, most tragic of all, the world's population continued to increase—the actual increase since 1939 has been round about 100 million people.

So here was F.A.O.'s problem—it had to bring:

(i) More people

(ii) at least back to the pre-war level of food consumption (when two-thirds were starving or near-starving); and

(iii) raise the food consumption of all these people up to the minimum standard of food requirements for health, universally agreed upon.

How was this problem to be met? It was clear, in the first place, that co-operation would have to be the keynote of all efforts. World production and distribution would

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need re-organisation, especially in backward areas. The United Nations felt that an organisation could best co-ordinate all the multitude of activities implied in these broad aims. After Hot Springs, the nations considered the proposal, and at Quebec in 1945, the Food and Agriculture Organisation came into being. F.A.O. has continued to grow and expand its activities and now has fifty-seven members. Annual Conferences have been held, in Copenhagen in 1946, at Geneva in 1947, and this year's Conference began in Washington in November.

F.A.O. aims to assist in the organisation of the production and distribution of the products of the land, the sea and the forest to the maximum benefit of all peoples. This is the basic objective. F.A.O. has no executive authority; it can only recommend action to member nations. However, as a result of continued active co-operation, F.A.O. has done a very great deal of valuable work.

WHAT HAS F.A.O. DONE?

The following headings give some idea of the work of F.A.O.:—

1. Food Allocation.

Through its World Food Council, F.A.O. has continued to suggest an equitable distribution of food, and, although not all recommendations are accepted, the resulting distribution has been far better than if F.A.O. did not exist.

2. Missions.

At the request of member governments concerned, F.A.O. sent technical missions of scientists and agricultural experts to Greece, Poland, Siam and Venezuela to study development problems and recommend action to the Governments concerned.

3. Provision of Technical Assistance.

(*a*) *Seeds*—

(i) In the summer of 1947, F.A.O. demonstrated the latest corn-breeding techniques to a gathering of European scientists in Italy.

(ii) F.A.O. recently sent hybrid corn seed to testing stations in thirteen European countries, and in Egypt, Lebanon and Syria.

(iii) Since early this year F.A.O. has been sending seed samples of new or better varieties of crops to Eastern Europe and China.

(iv) Aid was given in fighting a severe outbreak of chestnut blight in Italy.

(*b*) *Demonstration Schools*—

(i) F.A.O. held a demonstration school on artificial insemination in Italy in 1947, and, later sent semen from America to Italy for testing.

(ii) F.A.O. held a demonstration school in England on vaccines and serums.

(*c*) *Water Conservation*—

(i) F.A.O. has laid plans for irrigation, drainage and flood control projects in ten Chinese provinces to improve 106,050 acres of land.

(ii) F.A.O. is co-operating in plans of the Chinese authorities for irrigation by pumping.

(*d*) *Animal Health*—

(i) Rinderpest—the most serious of diseases of cattle in China—may be eliminated from the area south of the Yangtze River as a result of F.A.O.'s full-scale vaccination programme. Similar work is promised for Siam.

(ii) F.A.O. helped the Polish Veterinary Department launch a drive to stamp out tuberculosis in cattle in the province of Todz.

(iii) Also in Poland, F.A.O. is helping in the testing of a new vaccine against hog cholera.

(*e*) *Insects, Pesticides, etc.*—

F.A.O. is giving close attention to the matter of food losses brought about by rodents, insects and other agents. It sent an entomologist to Cairo to advise the Egyptian Government on methods of minimising losses of stored grain.

(*f*) *Farm Machinery*—

(i) An F.A.O. farm machinery specialist spent part of 1947 in Austria demonstrating the use of new machines.

(ii) Three experts conducted schools in Poland for the same purpose.

(*g*) *Regional Assistance*—

Six F.A.O. technicians were sent to the Near East this year to assist in developmental projects.

Co-operation with Other U.N. Organisations.

F.A.O. has actively co-operated with other United Nations Organisations, *e.g.*, the World Health Organisation, the United Nations Appeal for Children, etc.

F.A.O. AND THE AUSTRALIAN FARMER.

What is the relation of F.A.O. to the Australian farmer? In the first place, it is essential to remember that Australia is one of the few large exporters of food. Therefore, in a starving world we have an obligation to send away the greatest possible amount of food. This does not mean that we are expected to give food away—although in the past we have borne our share of food distributed freely by U.N.N.R.A., and more recently by F.A.O., to displaced children. F.A.O. insisted right at the beginning that the exchange of food should take place at a price suitable to both the producer and the consumer.

The main problem at the moment is that many nations have little purchasing power, or, in any case, cannot afford high prices. Perhaps the long-range solution is an increase in industry in backward areas, and also that farmers should obtain their incomes by increased output at lower prices. In any case, if the Australian farmer is to help in the present crisis, when he can expect to sell all he produces, he must adopt the most advanced methods of farming within his means. He must be efficient.

Another important point about F.A.O. is that, if standards of consumption are raised, the extra food needed will create an even greater demand for Australian production, giving much more security than was experienced in earlier years. In other words, if F.A.O. succeeds in its objectives, the Australian farmer will be better off.

This leads to the final point—that the Australian farmer would do well to keep himself informed about F.A.O. To enable him to do this, Commonwealth and State Committees have been set up by the respective Governments comprising representatives of agricultural, health, fisheries, forestry and conservation authorities.

WATCH FOR STATEMENTS ABOUT F.A.O.

J. B. MAYNE, Executive Officer,
N.S.W. State F.A.O. Committee.

TRACTOR OPERATING COSTS.

WHAT is it costing you to operate your tractor? Do you know? Have you ever taken the trouble to figure it out?

Last month we discussed the question of buying a new tractor and dealt with some of the factors that should be taken into consideration when contemplating its purchase. One of the most important of these is its future running cost.

It is strange, but undoubtedly a fact, that the vast majority of farmers grossly underestimate their tractor operating costs. Many farmers appear to count as costs only those cash expenses incurred on such items as kerosene, petrol, oil and repairs, overlooking entirely depreciation and interest, as well as housing costs and wear and tear on tyres. It is also frequently not realised that repairs, although usually light during the first year or two (perhaps for longer — depending largely on the amount of annual use), become very heavy in the later stages of the machine's life. Experience in the United States indicates that total repair costs during the life of a machine may often amount to as much as the original cost of the tractor.

This failure to take full account of all operating expenses is frequently reflected in the prices private tractor contractors charge for their work in the early stages of their careers as contractors. Frequently they do not realise their charges have been too low until the time comes to replace their worn-out equipment; then it is often too late, and consequently the number of bankruptcies experienced by private machinery contractors in rural districts is fairly high. Undoubtedly many farmers who supplement their farm income by doing tractor work for other farmers in the district, or who merely oblige neighbours from time to time, operate at rates which are uneconomic in the long run; cash expenses are covered and superficially it may appear that there is some profit, but if all expenses, both cash and overhead, were taken into account it would often be found that the work was being undertaken at a loss.

Different Types of Costs.

There are two distinct types of tractor operating costs and it is most important that their existence should be recognised. First there are those obvious costs such as kerosene, petrol, oil grease, cash repairs and

servicing charges and, in some cases, wages costs. These are known as cash costs; they are the costs usually associated with tractor operations by the farmer.

There is, however, another equally important group of costs known as overhead costs; it includes depreciation, interest on capital invested in the tractor, an allowance for wear and tear on tyres, housing and insurance. *During the working life of a tractor these overhead costs will often amount to as much, and sometimes to even more than the cash costs. At the very minimum they will amount to 30 per cent. of total costs.*

Investigational Work by the Department.

During the past few years the Division of Marketing and Agricultural Economics has been investigating the cost of operating farm machinery used by several of the pools established under the New South Wales Farm Mechanisation Scheme, and more recently this work has been extended to cover investigations into the cost of operating small tractors on South Coast dairy farms. Although these investigations have not yet been completed, sufficient information has been obtained to make fairly accurate estimates of tractor operating costs under normal conditions.

The figures which follow should prove of great value to the farmer who wants to get some idea of the costs he will incur if he buys a tractor. They should also assist those farmers who hire out their machines to determine a fair charge. The figures have been prepared in collaboration with the Farm Mechanisation Section, Division of Plant Industry.

A large number of tractors, of all types, sizes and makes, are in use throughout New South Wales. For purposes of classification tractors have been divided into four groups. The average drawbar rating of each group and the average cost of tractors in each group are as follows:—

	Average Drawbar Horsepower.	Average Cost.*
Extra small tractors ..	14	£600
Small tractors	17	£650
Medium tractors	25	£750
Large tractors	33	£1080

* Some distributors quote prices which include such items as power take-off, belt pulley, starting and lighting. Others quote a basic price which excludes those items. The average figures here used include an allowance for the abovementioned equipment when such is not included in the distributor's quoted price.

Costs Vary With Annual Use.

It will be noted that the cost figures which follow vary significantly according to annual hourly use. Hourly overhead costs are naturally much higher when a tractor is used only 300 hours per year than when it is used for 800 to 1,000 hours and this is a point which should be kept in mind when a tractor is being purchased. If it is to receive comparatively little use hourly costs will be high.

HOURLY TRACTOR OPERATING COSTS
(Excluding Wage Costs).*

Item.	Annual Use.			
	100 hrs	300 hrs	500 hrs.	800 hrs.
	s. d.	s. d.	s. d.	s. d.
EXTRA-SMALL TRACTOR.				
Overhead Costs—				
Depreciation	6 5	2 2	1 3	1 1
Tyre Allowance	0 9	0 6	0 6	0 6
Interest	2 5	0 9	0 6	0 4
Housing	1 9	0 7	0 3	0 2
Insurance	1 3	0 5	0 3	0 2
	12 7	4 5	2 9	2 3
Cash Costs—				
Repairs	0 7	1 1	1 2	1 4
Kerosene	1 9	1 9	1 9	1 9
Petrol	0 5	0 4	0 3	0 3
Oil	0 5	0 5	0 5	0 5
Grease	0 1	0 1	0 1	0 1
Total Costs	15 10	8 1	6 5	6 1
SMALL TRACTOR.				
Overhead Costs—				
Depreciation	6 9	2 3	1 4	1 2
Tyre Allowance	0 9	0 6	0 6	0 6
Interest	2 7	0 10	0 6	0 4
Housing	1 9	0 7	0 3	0 2
Insurance	1 3	0 5	0 3	0 2
	13 1	4 7	2 10	2 4
Cash Costs—				
Repairs	0 8	1 2	1 3	1 5
Kerosene	2 2	2 2	2 2	2 2
Petrol	0 5	0 4	0 3	0 3
Oil	0 6	0 6	0 6	0 6
Grease	0 1	0 1	0 1	0 1
Total Costs	16 11	8 10	7 1	6 9
MEDIUM TRACTOR.				
Overhead Costs—				
Depreciation	7 10	2 7	1 5	1 4
Tyre Allowance	1 0	0 7	0 7	0 7
Interest	3 0	1 0	0 7	0 5
Housing	2 0	0 8	0 4	0 3
Insurance	1 6	0 6	0 4	0 3
	15 4	5 4	3 3	2 10
Cash Costs—				
Repairs	0 10	1 3	1 6	1 8
Kerosene	3 1	3 1	3 1	3 1
Petrol	0 6	0 5	0 4	0 4
Oil	0 7	0 7	0 7	0 7
Grease	0 1	0 1	0 1	0 1
Total Costs	20 5	10 9	8 10	8 7

* Figures to the nearest penny.

HOURLY TRACTOR OPERATING COSTS
(Excluding Wage Costs) *—*continued.*

Item.	Annual Use.							
	300 hrs.		500 hrs.		800 hrs.		1,000 hrs.	
	s.	d.	s.	d.	s.	d.	s.	d.
LARGE TRACTOR.								
Overhead Costs—								
Depreciation	4	0	2	4	1	11	1	11
Tyre Allowance	0	11	0	11	0	11	0	11
Interest	1	6	0	11	0	7	0	6
Housing	0	8	0	4	0	3	0	3
Insurance	0	7	0	5	0	4	0	4
	7	8	4	11	4	0	3	11
Cash Costs—								
Repairs	1	9	2	3	2	5	2	5
Kerosene	3	11	3	11	3	11	3	11
Petrol	0	6	0	5	0	5	0	5
Oil	0	8	0	8	0	8	0	8
Grease	0	1	0	1	0	1	0	1
Total Costs	14	7	12	3	11	6	11	5

* Figures to the nearest penny.

These are Average Figures.

These figures represent the average hourly cost during the life of the tractor, and not the cost at any particular point in time. There are a number of reasons why they may be different from your average costs.

Your costs may be lower because:—

(1) Your tractor was cheaper than average or was bought before tractor prices rose.

(2) You are working under exceptionally favourable circumstances.

(3) You have a sound mechanical knowledge and take care of your machinery.

(4) Petrol and kerosene prices are less than the figures assumed here (3s. and 1s. 9d. per gallon respectively).

Your costs may be higher because:—

(1) Your tractor was dearer than average.

(2) The conditions under which you have to work it are particularly unfavourable.

(3) Petrol and kerosene prices may be higher.

(4) You neglect the machine.

(5) You do not service it in accordance with the manufacturer's instructions.

(6) You do not provide adequate cover from the weather.

(7) You overload it or use it for jobs for which it was never intended and which result in undue strain and excessive wear and tear.

Some Points to Note.

Depreciation is based on the assumption that the average life of a tractor is 9,000 working hours or fifteen years, whichever is the shorter. It is assumed that when this point is reached the tractor is worth 10 per cent. of its original value.

Tyre allowance is computed separately from depreciation, due to the fact that the tyres do not last nearly as long as the tractor —they rarely give satisfactory service after 2,500 hours of work.

Interest is calculated at 4 per cent. of 50 per cent. of the original cost of the machine over its entire life.

Repairs become very heavy after 3,000 to 4,000 hours' work and average costs figures must take this fact into account.

Kerosene costs as given above may appear high at first sight, but they include kerosene used in travelling and also allow for wastage.

Petrol costs are of comparatively little importance. However, where a tractor is used for only short periods, hourly petrol costs will be higher than where the tractor is used for long stretches at a time.

Hourly housing and insurance costs are almost negligible when extensive use is made of the tractor, but when it is little used they are high.

Wage Costs.

The costs given above do not include wages costs, as tractor work is usually carried out by the farm-operator himself. However, where hired labour is employed to operate the tractor such costs must be taken into account, and it is important that it be realised that *the hourly wages cost will be more than the hourly wages rate*. By this it is meant that if a tractor operator is paid at the rate of 3s. 6d. per hour, the hourly cost of ploughing must include a wages charge greater than 3s. 6d., because to do that one hour's ploughing quite a lot of preliminary work will have to be done; the tractor must be serviced and moved from place to place, while from time to time breakdowns will occur and for other reasons time will be lost and wasted. This is sometimes appropriately referred to as "dead time." Consequently, if the hourly wages rate were 3s. 6d. the hourly cost of ploughing would be increased by from 4s. 6d. to 7s. per hour

(*Continued on page 630.*)

WHIPTAIL OF CAULIFLOWER

Control by the Use of Ammonium Molybdate and Sodium Molybdate.

E. J. WARING, B.Sc.Agr., Agronomist, R. D. WILSON, M.Sc., M.Sc.Agr., Plant Pathologist, and N. S. SHIRLOW, B.Sc.Agr., Agronomist.

THIS article deals with experiments and observations which have been carried out during the 1947 and 1948 seasons in the central coast area of New South Wales, using ammonium molybdate and sodium molybdate for the prevention and cure of whiptail.

The easiest method of control appears to be to water the plants in the seed-bed with a solution of either ammonium molybdate or sodium molybdate one or two weeks before transplanting. At present it is recommended that each ten square yards of seed-bed be watered with 1 ounce of pure ammonium molybdate or 3 ounces of a crude (43 per cent.) sodium molybdate dissolved in about 10 gallons of water. These and other methods of control will be dealt with in more detail in the second part of this paper which will appear in the next issue of the "Gazette."

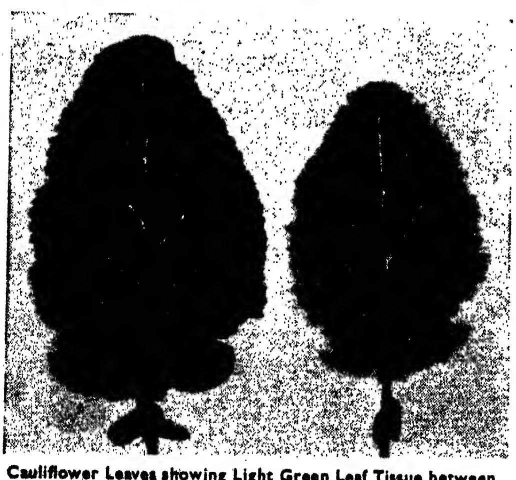
The use of ammonium molybdate or sodium molybdate is unlikely to be of any benefit to cauliflowers in localities where whiptail does not occur.

The whiptail disease of cauliflower derives its name from the symptoms observed in an advanced stage of the disease when a leaf may consist of little more than a central midrib, with a narrow margin of green leaf tissue on either side. The disease can be responsible for serious losses in commercial crops, severely affected plants being considerably smaller than healthy plants and the curds of such affected plants also being small and sometimes unmarketable.

The disease has been officially recognised in New South Wales since 1925[7] but it is probable that it occurred in this State many years earlier. Whiptail has also been recorded in the United States of America,[2] England,[8] Fiji,[10] New Zealand,[3, 6] Victoria,[11] Queensland,[1] and Tasmania.[14] In New South Wales it occurs throughout the central coastal area, being particularly common on the Hawkesbury River flats around Windsor and Richmond and on the south-western

A Cauliflower Plant Seriously Affected with Whiptail.

Leaves of Cauliflower showing Severe Whiptail Distortion.



Cauliflower Leaves showing Light Green Leaf Tissue between the Veins and along the Edges.

Leaf on left shows slight chlorosis on margin only.
Leaf on right is more severely affected.

outskirts of Sydney Metropolitan Area in the region between Bankstown, Liverpool and Parramatta and west thereof. It is also known to occur in the eastern section of the Gosford-Wyong district and on parts of the Southern Tableland. The writers have little information of its occurrence elsewhere in the State, but it is known that the disease is of no importance in the cauliflower-growing areas around Bathurst on the Central Tableland or on the Hunter River flats around Maitland.

Within individual crops, the disease often has a "patchy" distribution. One or two affected plants may occur amongst plants which are quite healthy or, alternatively, a few healthy plants may be present in the middle of a group of affected plants.

Symptoms of Whiptail.

As a result of the finding that molybdenum applications will prevent or cure the disease, it has been possible to link up certain symptoms, not hitherto recognised as part of the whiptail complex, with the main whiptail symptom.

By recording and observing individual plants, both treated and untreated, it has been found, as indicated elsewhere by Wilson and Waring,[15] that an early symptom of the disease is an interveinal chlorosis, in which the tissue between the main veins is a yellowish-green colour rather than a healthy, dark-green colour. Davies[3] and Hewitt and Jones[4] also recorded this interveinal chlorosis on plants which later developed whiptail symptoms. The condition appears to be identical with one which had previously been observed in association with whiptail-affected plants by Parbery[9] but which had been attributed to a deficiency of magnesium.

The interveinal chlorotic tissue has a high content of oxidising materials (presumably mainly nitrates) and, as reported by Wilson and Waring,[15] these disappear after the application of solutions of sodium molybdate or ammonium molybdate. This intervenal chlorosis may occur in all of the outer leaves and may sometimes persist when they are full sized. It has not been observed on any of the youngest leaves but these (on plants whose older leaves are showing the interveinal chlorosis) may show a breakdown of the leaf edges. It is this edge burn of the youngest leaves which represents the fate

of the missing portions of a whiptail leaf, and the severity of the subsequent distortion of the mature leaf is related to the degree of this initial edge burn.

The distorted whiptail leaves which develop from the young leaves showing edge burn, unlike the earlier affected mottled chlorotic leaves, are dark green in colour, and chemical tests show that the interveinal tissue is not high in nitrates or other oxidising materials. In some cases, the small leaves, as they form, continue to show edge burn and these develop into more whiptailed leaves. In other cases there may be a recovery of mottled plants, with later growth showing no edge burn of the young leaves and subsequent whiptail. It has been observed that, after the small leaves have shown edge burn and have developed into full-sized "whiptailed" leaves, the interveinal yellowish-green colour tends to disappear from the outer leaves, so that by the time the curd commences to form there may be little evidence of the cholorosis of the outer leaves.

Interveinal Chlorosis of Cauliflower Leaf.
Left.—Chlorotic leaf.
Right.—Healthy leaf.

Factors Affecting Whiptail.

Soil Acidity.—In 1925 it was reported by Clayton[2] in the United States and later by Wessels[18] in the same country, Magee[5] in New South Wales and Stubbs[11] in Victoria, that whiptail was of more importance on acid soils and that liming would in most cases give satisfactory control. The writers have found fairly good correlation between the occurrence of whiptail and soil acidity, but it is of interest to note that, whereas in the Fairfield-St. John's Park-Wetherill Park section of the Sydney Metropolitan Area and at Kurrajong whiptail has not been observed in soils less acid than pH 5.5, in the Windsor-Richmond area, severe whiptail has occurred in soils with a pH well above 6.0.

Variety.—The experience of growers and observations by the writers and others have indicated that, as a general rule, early maturing varieties such as Snowball, Nugget and Hawkesbury Solid White are more liable to be affected with whiptail than later maturing varieties. It is mainly for this reason that many growers in the south-western section of the Sydney Metropolitan Area have confined their plantings almost entirely to the later maturing "Five-months" and "Six-months" types.

Seed Origin.—Observations by one of us (E.J.W.) suggest that seed produced on whiptail-liable soil is more likely to produce whiptail-affected plants than seed from plants grown on soils where whiptail does not occur.

Fertilizers.—Heavy applications of nitrogenous fertilisers have been reported to induce a greater amount of whiptail. Growers in the Windsor district who have whiptail-liable soil appear to be unanimous in their opinion that more whiptail will occur where sulphate of ammonia is used than where blood and bone or animal manures are applied. No great amount of information is available concerning the effect of nitrate of soda in comparison with sulphate

of ammonia, though one observation by the writers indicated that the application of nitrate of soda to plants showing the interveinal chlorosis, which precedes whiptail, intensified the chlorosis and made more severe the whiptail symptoms which subsequently developed, in comparison with similar untreated plants.

Soil Aeration.—Many growers in the Windsor district are of the opinion, based on many years' experience, that, if the soil between the plants is kept cultivated, whiptail will not develop in the crop or will be less severe. There appears to be some justification for this belief. The writers have observed in several crops that whiptail was more prevalent on the edge rows near paths or roadways, where the soil was more compacted.

Experiments in New Zealand with Molybdenum.

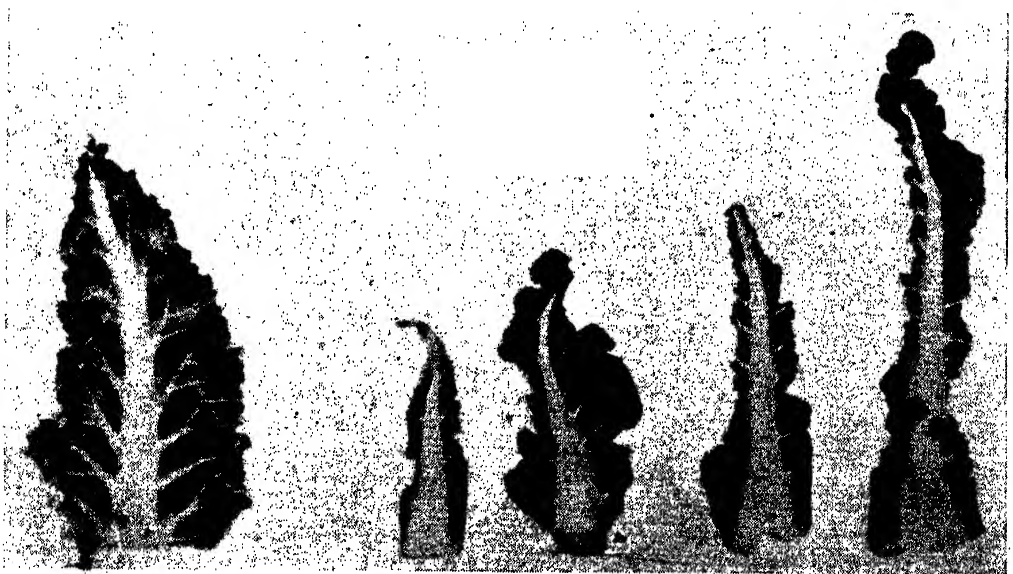
Credit for the first experiments connecting whiptail with a deficiency of molybdenum goes to Davies[8] in New Zealand. Subsequently Mitchell[9] in the same country showed that the application of ammonium molybdate at rates of 1 lb., 5 lb. and 20 lb. per acre would control the disease.

1947 Experiment at Windsor.

As a result of the New Zealand findings, it was decided to test the value of molybdenum in controlling whiptail under Australian conditions, and an experiment was carried out in 1947 on the property of Mr. J. Smith, Cornwallis, Windsor. In this experiment, which has been reported elsewhere,[12] one quarter of the thirty-two plots (each 11 yards by 11 yards) were treated with sulphur at the rate of 500 lb. per acre for the purpose of making the soil more acid and inducing a greater amount of whiptail, one quarter of the plots received dolomite at the rate of 1 ton per acre and one quarter at the rate of 2 tons per acre. The remaining plots had neither sulphur nor dolomite applied to them.

It was found in this experiment that where the soil was made more acid by applying sulphur prior to planting, sodium molybdate at the rate of 1 lb. per acre, dissolved in water and watered on to the land before planting, prevented all except a trace of whiptail, whereas where ¼ lb. per acre was applied, almost half the plants showed some whiptail. Almost every plant in the plots to which sulphur, but no sodium molybdate, had been applied, was affected with whiptail, about half the plants being severely affected. No whiptail occurred in similar sulphured plots where sodium molybdate had been applied at the rate of 4 lb. per acre.

Plants in non-sulphured plots showed only a trace of whiptail, whilst where the soil was made less acid by applying dolomite, no



Small Heart Leaves of Cauliflower.

Left.—Healthy. *Right.*—Showing edge burn which results in the larger typical "Whiptailed" leaves.

Cauliflower Plant Showing Whiptail Distortion on Inner Leaves and Yellowing on Outer Leaves.

whiptail occurred. The results confirmed the earlier work in New Zealand,[3, 6] indicating that the use of molybdenum materials would control whiptail whilst they were also in agreement with the findings in the United States,[2, 13] and this country,[5, 11] that whiptail was more severe on acid soils and could usually be controlled by applying lime or dolomite to the soil.

Methods and Materials used in the 1948 Experiments.

In the past season further experiments have been carried out in the Windsor-Richmond district and in the Canley Vale-Fairfield-St. John's Park section of the Sydney Metropolitan Area, using both sodium molybdate and ammonium molybdate. Both C.P. and A.R. grades of ammonium molybdate have been used, whilst the sodium molybdate used was either C.P. grade or a crude sodium molybdate.

In the 1947 experiment the sodium molybdate was watered over the whole of the land prior to planting out, but, realising that in such a method of application much of the material would not be available to the plants, the writers have, in all the 1948 experiments, applied the sodium molybdate or ammonium molybdate directly to the plants either in the seed-bed or after planting out. In the case of applications to plants in the field the following methods have been used:—

(1) As a solution in water, applied to the surface of the soil at the base of each plant by means of—

(*a*) A sheep drenching gun supplied from a knapsack tank carried on the back;

(*b*) A small bottle or tablespoon, dipping the solution from a bucket or watering can;

or—

(*c*) A watering can with the rose removed;

Or (2) Mixed with superphosphate and applied as a side-dressing to the soil at the base of the plant.

Rates have ranged from ¼ lb. to 4 lb. per acre and, when applied as a solution, the amount of solution used has ranged from about one-third fluid ounce to 3 fluid ounces of the solution per plant. In the case of seed-bed applications, the solution was applied by a watering can two days to four weeks before transplanting.

In several of the experiments carried out during the past year in which applications of sodium molybdate or ammonium molybdate were made to plants directly in the field, whiptail developed in neither the treated nor untreated plants and most of the information has been obtained from the treatment of plants showing the interveinal chlorosis, which precedes whiptail, or of more severely affected plants. Thus, because of the sporadic and patchy occurrence of the disease, it has been found more advantageous, from an experimental point of view, to treat plants already diseased than to treat plants with the possibility that whiptail might occur in the untreated plants.

Effect of Soil Acidity and Sodium Molybdate on Whiptail.

An experiment similar to that which was carried out during 1947 on Mr. Smith's property at Cornwallis, was conducted in 1948 at Hawkesbury Agricultural College, Richmond. Three levels of soil acidity were provided by applying sulphur at the rate of 500 lb. per acre, no sulphur or dolomite, and dolomite at the rate of 2 tons per acre. Five rates of sodium molybdate (0, ½, 1, 2 and 4 lb. per acre) were used—the solution being applied to the plants in the field one week after transplanting.

Out of a total of 2,304 plants, only sixty-three plants showed any symptoms of whiptail, and none of these sixty-three plants was severely affected. Forty-three of these plants were in the plots which had received sulphur and no molybdenum, nineteen in the plots which had received no sulphur, molybdenum or dolomite, and one in a plot which had received dolomite and ½ lb. sodium molybdate per acre. Thus, of 576 plants not treated with sodium molybdate, sixty-two plants were affected with whiptail and of 1,728 plants treated with sodium molybdate only one developed whiptail.

The effects of soil acidity on whiptail were less marked in this experiment than in the 1947 experiment. At the completion of the experiment the average pH reading of the sulphured plots was 5.2, that of the untreated soil 5.6, and that of the plots to which dolomite had been applied 6.7.

Effect of Sulphate of Ammonia and Sodium Molybdate on Whiptail.

In an experiment carried out during 1948 on the property of Mr. J. Smith, Cornwallis, Windsor, sodium molybdate was applied to six rows at the rates shown in Table I, two additional rows being left untreated. Sulphate of ammonia was applied to half the plants at the rate of 1 bag (160 lb.) per acre whilst the other half of the plants received this fertiliser at the rate of three bags per acre.

Table I.—Effect of Sodium Molybdate and Sulphate of Ammonia on the Development of Whiptail.

Sodium molybdate, rate per acre in lb.	Sulphate of ammonia, rate per acre.			
	3 bags.		1 bag.	
	Plot 1.	Plot 2.	Plot 1.	Plot 2.
0	19/24	17/20	9/23	14/24
½	0/22	0/24	0/25	0/25
1	0/23	0/23	0/24	0/25
2	0/25	0/23	0/23	0/24

* Numerator—Number of whiptail-affected plants.
Denominator—Total number of plants.

It will be observed that, in this experiment, fifty-nine of ninety-one plants not treated with sodium molybdate developed whiptail, whilst none of 286 treated plants were affected.

In the no-molybdenum plots, not only were the numbers of affected plants somewhat greater, but whiptail symptoms also appeared much earlier and were more severe where the higher rate (three bags per acre) of sulphate of ammonia was used.

In two similar experiments at Canley Vale where sulphate of ammonia and nitrate of soda were applied, no symptoms of whiptail developed in either experiment.

(To be concluded.)

Business of Farming—*continued from page 624.*

(varying under different circumstances) if wages costs were added to those costs quoted above.

Don't Forget Your Implement Costs!

Here we have been concerned only with tractor costs. There are also, however, other costs associated with your tractor operations—your plough and harrow costs, your combine and header costs. These costs are often high also—sometimes very much higher than is generally realised. In making your calculations don't overlook them.—P. C. DRUCE, Economics Research Officer.

AGRICULTURAL BUREAU FIELD DAY.

Many Farmers Meet at Foxground.

A VERY successful "field" day and convention was held on 25th November by the Illawarra Division of the Agricultural Bureau. The attendance exceeded 300—farmers and their families from Menangle to Nowra, as well as local Junior Farmers.

The day's programme included lectures and demonstrations for men and women, stock judging contests for adults and Junior Farmers, and also flower, cookery and needlework competitions.

Stock Judging Contest were a Feature of the Day.

Junior Farmers are here interested in their section of dairy cow judging.

Other contests include dairy herd sire and working farm horse.

Mr. T. W. Murphy Demonstrating Egg Pasteurisation.

Mr. R. M. Watts, District Veterinary Officer, County of Cumberland, spoke on the problem of sterility in dairy cattle and exhibited many specimens to illustrate his remarks.

Mr. T. W. Murphy, Bacteriologist of the Department, staged a demonstration of the pasteurisation of eggs, which interested a women's session, and talks were also given by Miss Nancy Foskett, Extension Officer of the Department (on "Safety in the Home"), and by an officer of Kiama Ambulance.

The evening session, held in the Gerringong Town Hall, was addressed by Mr. Milton Buttsworth, who described his experiences during a recent tour abroad as a member of the Rural Bank Progressive Farmer Team. Delegates were interested to hear at first hand of dairying conditions in America and Britain.

Local arrangements for the field day were in the hands of the Broughton Village and Foxground branches of the Agricultural Bureau, with Mr. Len Flint, Illawarra Division Advisory Councillor, as organiser.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Albion Park	January, 14, 15
Dapto	January 21, 22
Lithgow	February 4, 5
Liverpool	February 5, 6
Luddenham	February 11, 12
Pambula	February 11, 12
Paterson	February 11, 12
Dorrigo (H. S. Doust)	February 16, 17
Tenterfield	February 17, 18, 19
Candelo	February 18, 19
Gunning	February 18, 19
Wyong (F. Akhurst)	February, 18, 19
Cobargo	February 23, 24
Newcastle (P. Legoe)	February 23 to 26
Rylstone	February 25
Guyra	February 25, 26
St. Ives	February 25, 26
Yass	February 25, 26
Coonabarabran (M. J. Hennessy)	March 1, 2
Walcha	March 1, 2
West Maitland (R. E. Holroyde)	March 2-5
Bega	March 3, 4, 5
Glen Innes	March 3, 4, 5
Comboyne (W. R. Cooke)	March 3, 4
Penrith (A. Tornaros)	March 4, 5
Mudgee	March 4, 5
Queanbeyan	March 4, 5
Uralla	March 4, 5
Blayney (K. Gresser)	March 8, 9
Tumbarumba (Mrs. U. H. O'Shea)	March 8, 9
Gulgong (T. Amies)	March 9
Cooma	March 9, 10
Blacktown	March 11, 12
Braidwood	March 11, 12
Burrowa	March 11, 12
Cessnock	March 11, 12
Inverell	March 11, 12
Moruya	March 11, 12
Dunedoo	March 14
Mendooran	March 16
Bombala	March 16, 17
Armidale	March 17, 18 19
Crookwell	March 17, 18 19
Binnaway	March 18
Barraba	March 18, 19
Gloucester (Mrs. M. A. Newton)	March 18, 19
Gresford	March 18, 19
Parramatta	March 18, 19
Baradine	March 22, 23
Warialda	March 22, 23
Delegate	March 23, 24
Taralga	March 24, 25
Wauchope (L. Steel)	March 24, 25
A.C.T.	March 25, 26
Bingara	March 25, 26
Castle Hill	March 25, 26
Dungog	March 25, 26
Manilla	March 25, 26
Muswellbrook	March 29, 30
Tamworth	March 29, 30 31
Camden (G. V. Sidman)	March 31, April 1, 2
Goulburn	March 31, April 1, 2
Quirindi	April 1, 2
Sydney Royal	April 9 to 19
Gunnedah	April 26, 27, 28
Kempsey (C. H. Riggs)	April 26, 27, 28
Boggabri	April 29, 30
Horsley (J. A. Siggers)	April 30
Narrabri	May 5, 6
Grafton (C. C. Pitt)	May 5, 6, 7
Hawkesbury District (Clarendon), (T. J. Cambridge)	May 5, 6, 7
Orange (N. J. Aird)	May 5, 6, 7

Approved Vegetable Seed—December, 1948.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—continued.

Cauliflower—

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

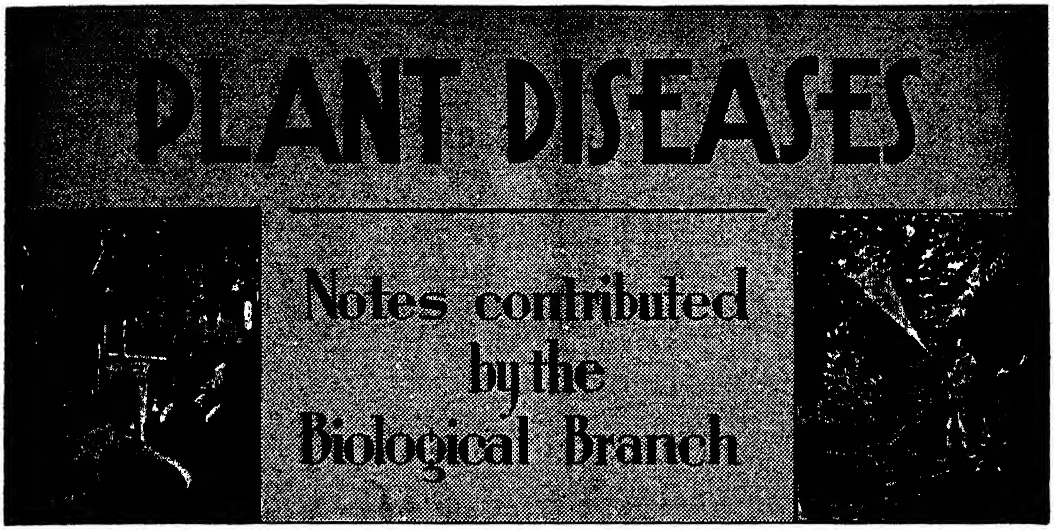
Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Tomato—

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

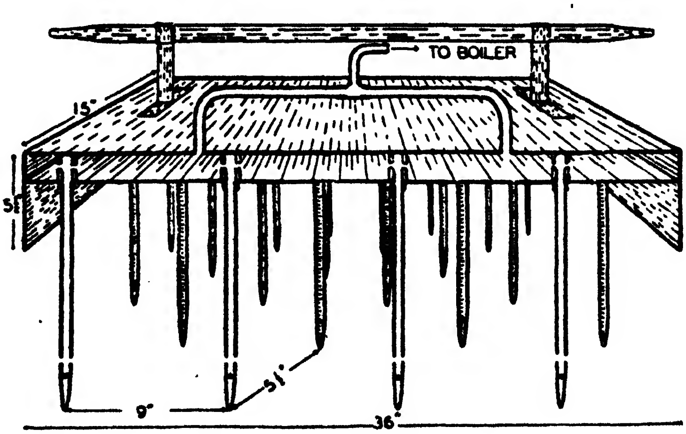


STERILIZATION OF SEED-BED SOIL.

MANY diseases of vegetable and flower crops are soil borne. Infection may start in the seed-bed following the use of soil contaminated with a pathogenic organism, and seedlings may be set out in the field carrying the disease to new areas of soil, resulting in an unhealthy and unprofitable crop. Even when seedlings are to be put out into a soil which is already contaminated with a pathogenic fungus or bacterium, they have a much better chance of fighting the disease and producing a worth-while crop if they are healthy when they are transplanted. It is therefore most desirable that the seed-bed should be free from harmful disease-producing bacteria or fungi.

Clean soil for seed-beds is often obtained by using virgin soil, *e.g.*, from bushland or from a pasture paddock which has not grown cultivated crops, or even from a cultivated paddock that has not grown a crop of the particular vegetable or flower which is to be planted. This procedure, however, is not a complete guarantee of freedom from disease. Moreover it is not always possible to get such virgin soil easily.

If the soil is known to be contaminated, or if any doubts are entertained regarding its freedom from disease-causing organisms, some method of soil sterilization should be adopted. Where seedlings are raised in



Spike Harrow for Steam Sterilization.
Drawing by G. G. Taylor.

boxes or frames it is desirable to clean and treat these as well as the soil, particularly if they have been used before. The method to be used will depend on the materials and equipment at hand, available labour, and size and location of seed-beds.

After the soil has been sterilized, it is of importance not to permit it to become recontaminated by the careless use of tools which might carry infection from non-treated areas, or by transference of soil on boots of workmen, etc.

Not only are fungi, bacteria and nematodes killed by sterilization, but insects, insect eggs, slugs, snails, etc., are controlled and weeds are almost completely eliminated.

Soil may be sterilized either by heat or by chemical means; but in either case the cost is comparatively high and it is not economic to treat large areas. However, it does pay to sterilize seed-beds and thus help to assure that plants are free from soil-borne disease when they are transplanted. It is also highly desirable, and profitable, to sterilize rather larger areas where high-priced luxury crops, such as glasshouse tomatoes, are grown in the same soil year after year.

Methods of soil treatment are described in Plant Diseases Leaflet 103, "Sterilization of Seed-bed Soil."

LEAF MOULD IN GLASSHOUSE TOMATOES.

LEAF mould or mildew is one of the most serious diseases with which the grower of glasshouse tomatoes has to contend. The chief damage occurs on the foliage, but flowers and young tender stems may occasionally be attacked.

The disease appears as small, circular, powdery patches on the undersurface of the leaves; these patches enlarge rapidly, the colour changing to pale-buff and, finally, to light-brown. The spores of the fungus are produced on these areas in very great numbers and are responsible for the colour developed on the mature spots. The spores are very small and light and easily dislodged and are readily spread throughout the house by air currents. The upper surface of the leaf over the affected area becomes yellow, and as the disease progresses the affected areas die. Flowers which become infected fail to set fruit.

The intensity of the disease varies with the seasons — warm temperature and high humidity being most conducive to a severe attack.

The disease is of little or no importance in outdoor crops in most areas throughout this State, but heavy and damaging infections often occur following cloudy and humid autumn weather when field crops are grown in the vicinity of glasshouses in the Warriewood-Mona Vale district.

Control.

The spores of the fungus are able to live from one season to the next and thus, at least some infection is unavoidable in commercial glasshouses. However, the degree of initial infection of each new crop is directly proportional to the number of spores carried over and any practice which will reduce the number of such spores is of benefit.

Burn Plant Remains.—Burning is easily the most certain method for the destruction of spores, and all plant remains, together with tying materials, should be dried out and burned immediately cropping ceases at the end of the season.

Fumigate the Houses.—Fumigation of the house destroys spores which have lodged in various portions of the building and would otherwise serve as a source of infection for the following season's crop. Such fumigation should be carried out after, not before, the burning of the dried-out plants.

One of the simplest and cheapest methods of fumigation is by burning sulphur. Usual recommendations are:—1 lb. sulphur to each 1,000 cubic feet, but in practice, it has been found best to use only 4 lb. to a standard house (8,280 cubic feet) when metal rafters, which are attacked by sulphur fumes, are present. The house should be sealed as well as possible, and the sulphur spaced throughout the house in shallow tins in ½ lb. quantities. If the sulphur is damped with methylated spirits it will ignite readily and continue to burn satisfactorily.

Ventilation.—Leaf mould development is encouraged by high temperatures and high

Tomato Leaves Affected with Leaf Mildew.

humidity. The rate of spread of the disease can be greatly restricted if careful and constant attention is given to ventilation during the growth of the crop.

Spraying.—Experiments have shown that Shirlan applied every 14 days is the only material which will give satisfactory control without adversely influencing the growth of the plant. Shirlan A.G. (a proprietary form of the chemical salicylanilide) has been successfully used for many years at the rate of 1 pint to 40 gallons of water. However, from observations made this year it would appear that 50 per cent. water dispensible Shirlan will prove to be equally effective. Other commercial forms of salicylanilide, if available, would possibly also be useful in controlling the disease.

The spraying programme should begin a few weeks after planting out and before any mould has developed on the leaves. Application of spray must be very thorough and particular care must be taken to cover the undersurfaces of the leaves.

Locust Information Service.

For effective control of any locust outbreak, it is most important to know beforehand when it is likely to occur, and to have detailed information of the areas most liable to heavy infestation during the initial stages of an outbreak. If such information is available, control measures can be set in motion without delay and so prevent wider occurrences of the locusts during the second and third generations.

For this purpose the Department maintains a special Locust Information Service operating on a widespread basis. Stock Inspectors throughout the Central Division of New South Wales are provided with printed report forms which include maps of their Pastures Protection Board district on which they can indicate by simple code symbols, the presence of egg buds, hopper swarms or flying swarms as the case may be.

With this service, valuable information is being obtained to enable effective measures for control of this pest to be put in hand *before* outbreaks become severe. Without this information, it would be impossible to estimate where and when supplies of material are necessary to enable control of the locust to be attempted by landholders.—T. McCarthy, Chief Entomologist.

Hawkesbury Agricultural College.

Scholarships Available for Competition in 1949.

A REMINDER is given by the Department of Agriculture that the scholarship provided by the Royal Agricultural Society of New South Wales, and the A. K. Trethowan and W. S. Pender Memorial Scholarships, tenable in the Agriculture Diploma Course at the Hawkesbury Agricultural College, Richmond, will be open for competition in January, 1949.

Candidates will require to have passed in at least seven subjects of the syllabus prescribed for the Intermediate Certificate Examination. The award of the Scholarships will be determined mainly on the aggregate marks obtained in seven subjects passed at that examination, the "externally examined" subjects of which shall include:—

(*a*) English.

(*b*) Mathematics I or Mathematics II or General Mathematics.

Consideration may also be given to a candidate's additional educational qualifications; to his aptitude, fitness, physical strength and other qualifications necessary to become successful in agricultural work, and to any other relevant circumstance.

The Scholarships will be open for competition amongst candidates who are not less than sixteen nor more than nineteen years of age on the 3rd February, 1949, and who are natural-born or naturalised subjects of the King. Candidates or their parents must have had six months' continuous residence in this State immediately prior to 3rd February, 1949.

The Royal Agricultural Society's Scholarship and the A. K. Trethowan Memorial Scholarship cover the fees and deposit prescribed for the course together with text-books and other legitimate College expenses up to an amount of £70 per annum in each case. The W. S. Pender Memorial Scholarship is of a value of £20 per annum. Any charges or expenses in excess of the amount of each Scholarship must be met by the scholar.

The duration of the Scholarships is three years in the case of holders entering the first year of the Diploma in Agriculture Course and two years for those entering the second year.

The A. K. Trethowan Memorial Scholarship is available for competition only among lads whose parents or guardians are and have been for two years prior to the date of the award—

(*a*) financial members of the Farmers and Settlers' Association of N.S.W., or

(*b*) subscribers to *The Land*;

(*c*) actively engaged in primary production.

In the case of the W. S. Pender Memorial Scholarship, preference in selection will be given in the following order:—

(1) A son of a beekeeper.

(2) A Junior Farmer pursuing a beekeeping project.

(3) An applicant exhibiting interest in beekeeping.

Applications from persons desirous of competing for these Scholarships must reach the undernamed not later than 5th January, 1949:—

R.A.S. Scholarship: The Secretary, Royal Agricultural Society of N.S.W., 33 Macquarie-place, Sydney.

A. K. Trethowan Scholarship: The Managing Editor, *The Land* Newspaper, 57 Regent-street, Sydney.

W. S. Pender Memorial Scholarship: The Principal, Hawkesbury Agricultural College, Richmond, N.S.W.

Potato Growing Controls Revert to the State.

COMMONWEALTH control over the production and marketing of potatoes, in respect of 1947-48 crops produced under contract, ceased at 30th November.

Future production and distribution of potatoes, including the new season's crop, will be a function of the Potato Marketing Board, recently constituted under the Marketing of Primary Products Act.

It will be necessary for all growers to register with that Board at 263 Castlereagh-street, Sydney; growers will be obliged to notify the Board of the area planted and the period of planting. Forms in that connection may be obtained from country receiving agents.

Growers planting in excess of an acre of potatoes are still required to take out a licence under the Potato Growers Licensing Act, 1940. Growers should apply to the Department of Agriculture, Box 36A, G.P.O., Sydney, for licences, and a fee of 10s. is payable each year if more than one acre of potatoes be grown.

The Marketing Board's objective is so to regulate deliveries as to ensure a stabilised price to growers. The Marketing of Primary Products Act empowers the Board to constitute seasonal pools, and the Board has decided to set up monthly pools to fulfil its obligation in that connection. Growers will be paid for their products by the distribution committees as was the case whilst Commonwealth control existed.

Generally speaking, there will be little alteration in marketing procedure. Growers will need to deliver potatoes under instructions derived from receiving agents appointed by the distribution committees.

BERSEEM CLOVER

A Valuable Winter and Spring Fodder Crop

For the Hunter River District.

G. T. DAWSON, H.D.A., District Agronomist.

IN recent years phenomenal results have been obtained by dairy farmers who have planted areas of Berseem or Egyptian clover for the provision of winter and spring fodder in the Hunter River district. Berseem clover has been most aptly termed "winter lucerne" because it makes prolific growth during the colder months of the year.

Some dairy farmers on the Lower Hunter flats have sown this clover in March, obtained four good cuts of nutritious greenstuff during winter and spring, and then harvested a good crop of hay in November. Although Berseem clover only lasts one season it is comparatively shallow rooted, and grows in shallow soil situations where lucerne will not thrive.

Soils.

Berseem does best on the heavier loams, although it will grow quite well on lighter soils. The crop is better suited to old cultivation areas, rather than to country that has been newly broken up. Berseem should do well on river flats in the Upper Hunter area under irrigation.

Soil Preparation.

If possible it is advisable to precede the sowing with at least a short fallow period, during which the soil should be well cultivated to eradicate all weeds, and prepare a fine, well consolidated seed-bed.

Sowing.

To get the best from a crop of Berseem it should be sown at the end of February or early in March. If the crop is sown after mid-March less fodder will be obtained during the growing period.

From 12 lb. to 15 lb. seed per acre is broadcast and then lightly harrowed in. On friable loams that are not likely to set hard after rain, this operation may be followed with advantage by a light rolling. In soils deficient in phosphate it is advisable to apply 1½ cwt. superphosphate per acre at sowing time.

Pepper Bros. at Raymond Terrace, who grow this crop each year, generally sow ½ bushel per acre of Fulghum oats with the Berseem. Fulghum is a good oat variety for this purpose because its grows upright with the clover. The oats provides good feed in conjunction with the Berseem for the first two grazings, but subsequently the clover takes possession.

Good Feed for Milking Cows.

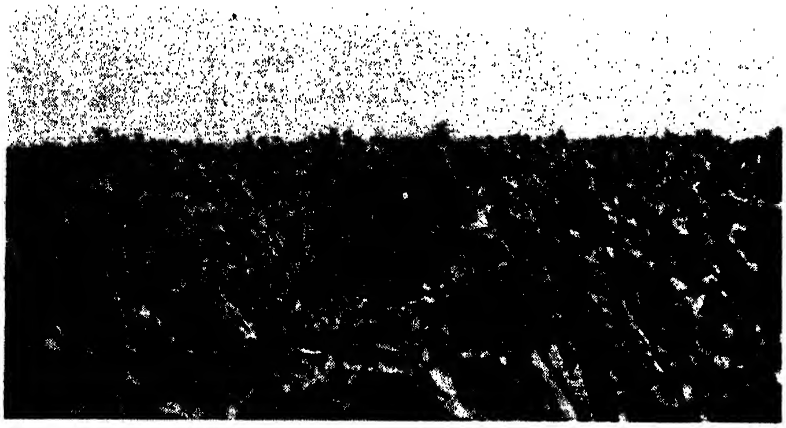
Berseem clover in its green state, or in the form of hay, is splendid fodder for milking

A Dense Crop of Berseem Clover in Full Flower on Mess Raymond Bros. Property at Raymond Terrace.
The area was harvested for seed.

cows and other stock. It is advisable to feed green Berseem after milking, to avoid any taint in the milk, although it imparts no more taint than does green lucerne. Poultry farmers are high in their praise of Berseem as a source of nutritious green feed for their flocks, at a time when lucerne growth is negligible.

Value in Rotation.

Experiments in this district have clearly demonstrated that river and other loams cropped for several years with maize, sorghum, oats and other non-leguminous plants become very deficient in nitrogen. As Berseem clover develops a large amount of nitrogen-bacteria nodules on its root system, it leaves behind, in the soil, much valuable nitrogen for the use of succeeding crops, and hence is ideal to grow in rotation with summer crops such as maize, sorghum, broom millet, potatoes, Japanese millet, etc., to assist in restoring and maintaining soil fertility.



Berseem Clover at Maitland.
Photographed in September after three hard winter grazings.

Growth under Adverse Conditions.

Berseem clover will stand up to wet soil conditions remarkably well. I have seen Berseem paddocks under water in wet seasons for periods up to four days without damaging the stand in any way.

On the other hand I have observed Berseem planted in March after a good summer fallow, germinate and make vigorous growth under extremely dry autumn, winter and spring conditions. The crop I have in mind provided four good grazings, *i.e.*, in June, July, August and early October. After the October grazing the area was allowed to mature seed, which was harvested at the end of November and early in December, 3 cwt. good quality seed being obtained per acre.

Feeding Berseem.

Some dairy farmers cut the green Berseem, chaff and feed to cows in conjunction with maize or sorghum silage. This constitutes a splendidly balanced ration, as Berseem is rich in protein. Stock may be grazed on Berseem after it has become firmly rooted in the ground and has attained a good height.

A word of warning is necessary regarding the danger of stock "blowing" on Berseem, especially in the spring. After grazing or cutting the crop it is inadvisable to put the stock in the paddock when the plants are making their fresh green shoot, as the animals will then "blow" very easily. The material should not be fed off until it is more mature, when the danger of bloat is negligible.

Harvesting for Hay.

The crop is ready to cut for hay when fresh shoots are coming away from the bases of the plants—as with lucerne. After cutting with a mower, the crop, if not too thick, is raked into windrows within two days.

Sometimes in the spring hay crops are so dense that it is impossible to rake the material into windrows. It is then forked into heaps and kept turned until quite dry. If on the green side when carted in, the material moulds very readily and is likely to powder up.

(*Continued on page* 652.)

FRUITGROWING.

SUMMER TRAINING OF STONE FRUIT TREES

On the Murrumbidgee Irrigation Area.

EFFECT ON WINTER PRUNING.

(*Concluded from page* 594.)

J. R. DAVISON, Fruit Inspector.

ON the Murrumbidgee Irrigation Area difficulty is commonly experienced in developing stone fruit trees of desirable shape and at the same time bringing them quickly into production. Hard cutting at winter pruning delays maturity, causes unwanted growth and, aided by the wind, uneven development. Less severe winter pruning, on the other hand, produces narrow trees with few limbs.

By a system of summer training most of these undesirable features can be avoided. In November issue Mr. Davison described the summer topping of peach trees; this concluding instalment deals with the summer treatment of apricots and prunes.

Trevatt Apricot.

The apricot does not lend itself to summer topping to the same extent as does the peach. The growth habit is different, and far more fruit buds develop on leading shoots than is the case with peach; generally it will be found that the upper third to half of leading shoots and strong laterals, and all light laterals developed after late November, will furnish almost exclusively with fruit buds. Such leaders left uncut or pruned anywhere within the area of fruit buds (Fig. 15) will bend under the weight of fruit set, and become useless as framework for the tree. Provided that the spread is satisfactory, the winter cut should be made at the leaf bud nearest the lower end of the area of fruit buds (A and A1 in Fig. 15).

Unfortunately, like most vigorously-growing trees, the apricot tends to run up tall and willowy. Summer treatment should be attempted to harness the energy of the tree and to prevent wind damage. The branching habit developed in November results in a solid body of leafage which is easily blown over or right off by the prevailing winds from the west. Summer topping removes much of this growth before it has a chance to develop.

Two main toppings and an intermediate lighter treatment are all that are required to achieve very good results in tree shape, and length of leader to be left at the winter pruning.

First Stage of Treatment.

Some time in November the leading shoot, and any other strong shoot for that matter, pauses in its rapid, single direction of

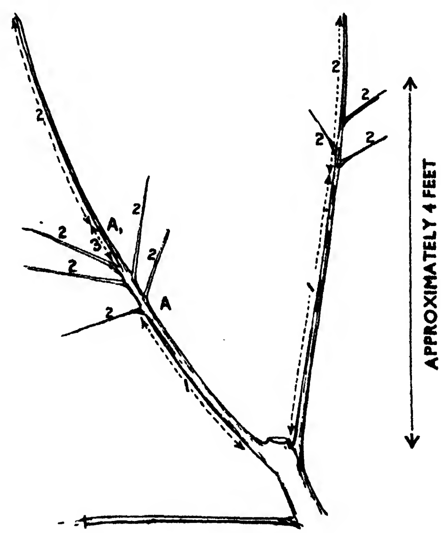


Fig. 15.—Type of Apricot Shoot Developed after Winter Pruning and No Topping.

1.—Area of leaf buds (wood buds). 2.—Area of fruit buds. 3.—Possible area of a few leaf buds. A or A1.—Probable location of winter pruning cut.

growth, and throws quite a cluster of short lateral shoots near its tip (see Fig. 16). Then the leading shoot carries on, and the laterals settle down as fruit-bearing wood.

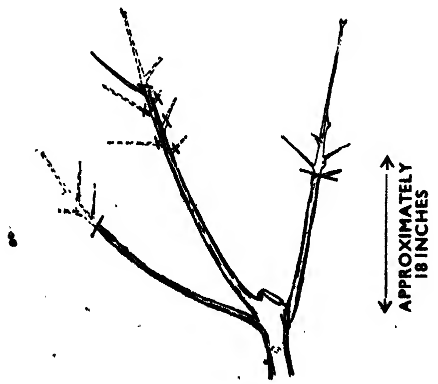


Fig. 16.—Topping of Apricot Shoot—First Stage. Growths are cut as marked.

When these lateral shoots are from 4 to 5 inches long, one, or maybe two, suitably placed is left untipped and the rest, including the original leading tip, are nipped back. Any strong horizontal growths are similarly dealt with.

An intermediate treatment which may be dispensed with if it clashes with harvesting of mature fruits, is simply a topping of all growths not required in the framework of the tree.

Second Stage.

This treatment takes place at a stage of growth similar to the first. There will again be the cluster of short laterals near the tip (see Fig. 17). The best placed shoot is left intact, and the others nipped back. By this time many inside growths will have developed rather strongly. These are cut hard enough to reduce them well below the tips of the leaders, and any other wood growths are nipped back to stop them extending too strongly.

The same vigorous growth as followed the November treatment cannot be expected, for most buds developed after this time are fruit buds. However it is often possible to gain 6 or more inches at winter pruning because the lower buds are leaf buds.

Fig. 15 represents the types of growth generally seen on an apricot tree that has not been topped during the summer. Note the leader and vigorous inside shoots which have to be cut hard at the winter pruning, and their stored energy lost. The approximate areas of fruit and leaf buds are indicated in this sketch.

Summer topping in two stages was applied to the trees shown in Figs. 18 to 22. Fig. 18 depicts a two-year-old tree before pruning in winter 1946, and Fig. 19, the same tree after pruning. The outward sweep gained through topping is noticeable about the level of the top of the pruning saw. Fig. 20 shows the same tree at a later date—December, 1947. This is near the stage at which the second topping takes place. Fig. 21 shows the same tree before pruning in 1948, and Fig. 22, after pruning. The marked sweep into the wind (right-hand side) can be readily seen in the photograph; this development is due entirely to summer topping.

Fig. 23 shows a tree in the same block, which shows somewhat better shape and development than that shown in Figs. 18 to 22. It will be noted that the winter pruning cut on the leaders is made at the highest suitably placed leaf bud, and that the fruiting wood on the current season's growth has all been removed.

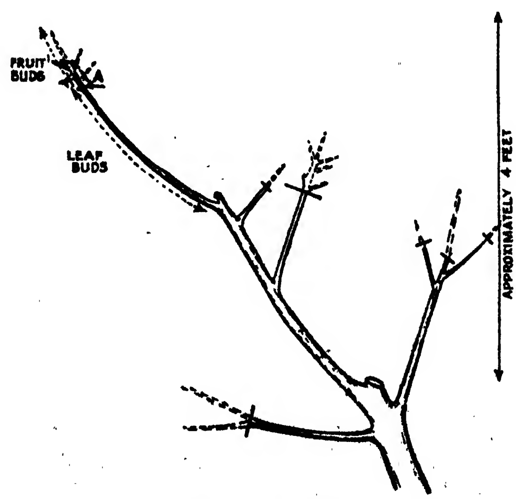


Fig. 17.—Second Stage Topping of Apricot Shoot. Growths are cut as marked. A.—Probable location of winter pruning cut.

Prunes.

The growth habit of prunes is superficially similar to that of apricots in that both produce light fruiting laterals or spurs from

Fig. 18.—Two-year-old Apricot Tree to which Summer Topping was applied in Two Stages.
Before winter pruning, 1946.

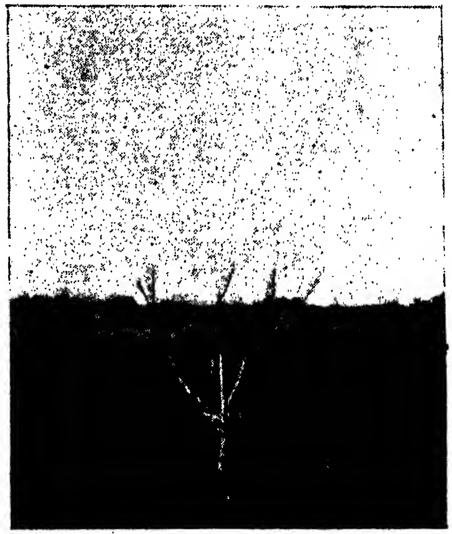


Fig. 19.—The Same Tree Winter Pruned.
Note the outward sweep of the leaders.

wood that is two years or older. There the similarity ends, for the prune shoot, although it may carry a few fruit buds at its base, is furnished with leaf buds for the rest of its length. The buds on the stronger growths are entirely leaf buds. Any shoot that is nipped back, whatever its strength, makes little further strong growth in that season as a general rule. Because of this, tipping will seldom cause lower buds to develop into shoots strong enough to work on as framework.

When cut fairly hard after the first season's growth, a limb will throw two or three strong upright shoots from the top buds. The inside growths will force the outside ones out at a wider angle, provided they are allowed to develop some length. It is enough to top once or twice during the season, but only those shoots which are obviously of no use as framework should be nipped back, and not before they have attained a length of 15 to 18 inches. The leaders should be left intact.

Fig. 20.—The Tree in December 1947.
About the time of second stage topping.

Fig. 21.—The Same Tree Before Winter Pruning in 1948.

Fig 22 —After the 1948 Winter Pruning
The marked sweep into the wind (right hand side) clearly shown, is due entirely to summer topping

Sometimes where growth is extremely vigorous, such as is the case with reworked trees, topping similar to that described for apricot can give good results, and produce excellent outward growth. However these are exceptional circumstances which do not apply to normally worked trees.

Quite frequently in the first season after planting, one shoot or sometimes two, will dominate the tree, leaving a weak but desirably placed shoot well behind Where topping is not done, the cutting necessary to level off the top of the tree in the winter will be very severe This can be avoided if the tree is judiciously topped, the dominant growths being nipped back when from 15 to 18 inches long It will then be found that the diverted sap will energize the weak shoot, and by winter it will be as strong as the others.

This nipping back is best done in late November or early December, but it really depends on the growth made. Unessential growths both inside and outside can be nipped back also at the same time. It is not wise to top the inside shoots too early or two strongly, as they will not then serve the purpose for which they are retained—to force the leaders out at a wider angle.

Summary.

1 Although peaches can be well shaped by pruning to the unstopped lateral, much tree energy can be lost through allowing strong unwanted growths to remain until the next winter pruning. This energy can be diverted by judicious summer treatment in such a way that little but excess fruiting wood remains for removal in the winter pruning

2 Although fortnightly treatment may be required to produce optimum results, excellent development can be achieved by summer tipping four times at monthly intervals or even a lesser number at longer intervals during the growing season.

3 The different habit of growth of apricots does not allow the same liberties to be taken with peach trees, but two or three judiciously spaced treatments can greatly improve apricot trees, and minimise the necessity for hard cutting in the winter.

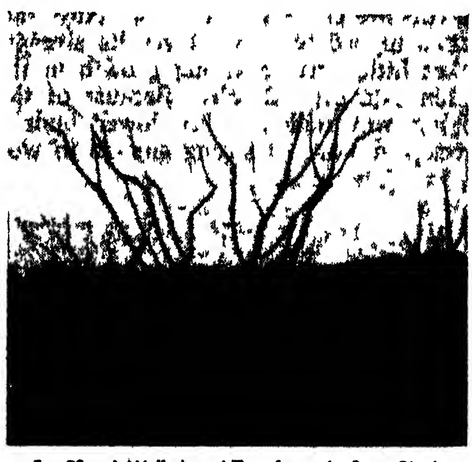


Fig. 23.—A Well-shaped Tree from the Same Block as Figs. 18 to 22.

4. Prunes cannot be shaped in the same way as either peach or apricot trees. Treatment is confined to topping once or twice to control inside growths, and to check dominant growths in order to allow weaker growths to make up.

HORMONE SPRAYS FOR APPLE CROP REGULATION.

Some Preliminary Experiments.

(*Concluded from page* 526.)

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Part 2.—Prior Research on Apple Thinning.

THE trials with sprays for fruit thinning described in Part 1 of this article in October issue, owe their origin to earlier research on hand thinning and detailed observations on the blossoming and setting process. This work established experimentally that thinning prior to the natural drops, and therefore called pre-drop thinning [1] appeared to be the most tangible means of regulating cropping. As the thinning effected by hormone sprays is a predrop thinning, the interest in these sprays is not only that they may be an inexpensive substitute for ordinary hand thinning, but that they may prove to be the means of bringing about a good measure of crop regulation in the industry. The research background referred to is described in this portion of the article.

THINNING EXPERIMENTS.

Experiments were carried out in the period 1938-42 at Orange, Oakdale and Batlow into the time at which thinning must be done to promote blossom bud formation and the degree of thinning that is required. For the purpose of establishing experimental results, the thinning was done by hand, at intervals up to eighty days from full bloom as regards the first objective, and by removing all the flowers or young fruits as the case may have been from varying proportions of the spurs in respect of the second proposition. The proportions, which were obtained by counting during the thinning operation, were one out of two spurs, two out of three, three out of four, and four out of five and five out of six spurs.

A single tree was devoted to each treatment and the treatments were extended to eleven blocks, over a period of three years; a total of 106 trees was brought under these thinning trials, exclusive of checks. The observed blossoming responses were checked by counts in many instances, and, in fact, in the first season were based entirely on counts of the spurs and fruit or blossom trusses occurring on each tree.

The varieties Delicious and McIntosh in the alternate cropping condition were used with the express purpose of breaking the biennial habit. The trees were mature, well clothed in spurs and showing a 90 per cent. or more blossom in the on-year when the thinning was done.‡

The results may be summarised as follows:—

1. Blossoming Promoted.

Blossoming was promoted in the following season. The order of the blossom increases was classified as—

(*a*) light (ranging up to 20 per cent.) in the case of trees the comparative check trees of which were completely "off." (Blocks 1, 2, 3, 4, 8 and 10 in Table 1.)

(*b*) medium (ranging higher than "light") in the case of trees with comparable check trees in the "light" year. (Blocks 5, 6, 7, 9 and 11 in Table 1.) This improved blossoming was sufficient in amount to give medium crops.

Space does not permit presentation of the complete detailed results, but the blossom produced in the year following all thinning treatments, is given in Table 1.

* These tests are in early stages and any recommendations are for experimental purposes only.

† In investigations into crop regulations over a period of years, the following officers actively co-operated: Messrs. J. D. Bryden, J. A. Holbeche, E. C. Levitt, S. A. Thornell and J. B. McGrath.

‡ The term per cent. blossom denotes the percentage of all shoots in spring that carried blossom.

Table 1.—Blossom Produced in the Year Following Thinning.

Block No.	Variety.	Year.	No. Trees.	Previous Treatment.	No. of Trees showing the following Per cent. Blossom.										
					0	—10	—20	—30	—40	—50	—60	—70	—80	—90	—100
1	Delicious ...	1939	14	Thinned	8	5	1	...	...	...	...	...	...	...	...
			2	Checks ..	2	...	...	...	...	...	...	...	...	...	...
2	" ...	"	14	Thinned	3	11	...	...	...	...	...	...	...	...	...
			2	Checks ...	2	...	...	...	...	...	...	...	...	...	...
3	" ...	"	14	Thinned	2	10	1	1	...	...	...	...	...	...	...
			4	Checks ...	4	...	...	...	...	...	...	...	...	...	...
4	" ...	"	12	Thinned	7	5	...	...	...	...	...	...	...	...	...
			3	Checks ...	3	...	...	...	...	...	...	...	...	...	...
5	McIntosh ...	1940	14	Thinned	...	...	...	3	1	2	1	...	4	...	3
			2	Checks ..	...	...	...	1	...	1	..	...	...	...	..
6	" ...	"	6	Thinned	...	1	...	1	1	1	...	...	2	...	...
			3	Checks ..	1	1	...	1	...	...	...	...	..	...	...
7	" ...	"	5	Thinned	...	2	...	1	...	...	1	...	...	1	...
			4	Checks ...	...	2	...	2	..	...	...	...	...	...	...
8	" ...	1941	8	Thinned	2	4	1	...	1	...	...	...	...	...	...
			4	Checks ...	4	...	...	...	...	...	...	...	...	...	...
9	Delicious ...	"	6	Thinned	...	...	...	..	...	1	1	...	3	1	...
			4	Checks ...	...	2	...	...	...	1	1	...	...	...	...
10	" ...	"	7	Thinned	...	4	...	..	...	3	...	...	...	...	...
			9	Checks ...	9	...	...	...	...	...	...	...	...	...	..
11	" ...	"	6	Thinned	...	...	...	...	...	...	...	...	2	4	...
			7	Checks ...	...	...	1	5	...	1	...	...	...	...	...

2. Effective Period.

The most effective period for thinning for the promotion of blossom buds is at or shortly after blossoming; thinning these varieties later than five weeks after blossoming held only a slight tendency to promote blossom buds to a greater extent than checks.

This is shown in the records assembled in Table 2.

Table 2.—Effect of Time of Thinning on Blossom Formation.

Treatment.*	Blocks.			
	5	6	7	8†
Thinned FB ...	80:100	...	...	...
" FC ...	60:100	...	...	...
" FD ...	75	80	90	3
" 20B ...	...	...	...	...
" 20C ...	40	...	...	10
" 20D ...	80:100	50:80	60	40
" 33C ...	50	...	...	10
" 33D ...	75	30:40	25	15
" 45C ...	25:30	...	...	...
" 45D ...	30:50	10	5:10	...
" 60B ...	...	...	...	0
" 60C ...	...	...	...	0
" 60D ...	...	...	...	7
Checks	30:50	0,10,30	10,30	Off

* Time of thinning is shown by F (Full Bloom) or the figure (20, 33, etc., days after full bloom); degree of thinning by the subsequent letter, as follows :—

A—1 out of 2; B—2 out of 3; C—3 out of 4; D—4 out of 5; E—5 out of 6 spurs defruited.

†Extremely dry season depressed blossom bud formation.

Even complete defruiting after this period did not result in blossom bud formation in these varieties when in the complete "on-and-off" condition. As the fruit which constituted the second drop was repeatedly observed to have become loose to the touch at thirty-five days, this effective period for blossom bud formation embraced the pre-drop period.

3. Degree of Thinning Effected.

The proportions of spurs defruited represented the rendering of 50, 67, 75, 80 and 83 per cent. respectively of the spurs fruitless. Within the effective period, only the high rates of thinning (above 75 per cent.) were reasonably productive of blossom. In fact, the 50 per cent. and 67 per cent. thinnings were practically discontinued after the first year.

However, the fruits on the remaining spurs did not always thin out to singles, and it was found, on complete counts made on all trees used in the first year, that, especially in Blocks 1, 2 and 3, thinning had reduced the fruiting to an *average* of one fruit to four to six spurs, whereas unthinned trees fruited at the rate of one fruit to two to three spurs. Expressed on the other basis, viz., the average number of fruits per 100 spurs, all trees in Blocks 1, 2, 3 and 4 showed the range given in Table 3.

Table 3.—Average Number of Fruits at Harvest per 100 Spurs per Tree.

	Block 1.	Block 2.	Block 3.	Block 4.
Thinned ...	18 to 27	16 to 33	17 to 33	13 to 22
Checks	35 to 53	46 to 89	42 to 52	18 to 38

The thinnings, as high as they seemed at the time when they were done, thus reduced

the number of fruits at harvest to only about half those on the check trees. Improvements in size may build up the yield to 75 per cent. of the check trees. This is shown, for instance, in Blocks 10 and 11 in Table 4. If thinning is heavier (or the setting ability low) it tends simply to reverse the years of the heavy crop, as seen in Block 9 in Table 4.

It is concluded that thinning to affect blossom bud formation should be of an order which will give about 50-60 per cent. of the numbers, and 75 per cent. of the yield in boxes of the heavy or "on-year" crop.

4. Growth Improved.

Early and drastic thinning, by removing the drain of excessive fruiting during the period when the majority of shoots (*viz.*, spurs) are capable of growth and their leaves of expansion, promoted improved spur growth and leaf development, which seems to be a requisite to blossom bud formation in trees which have blossomed excessively. This growth aspect is discussed in some detail elsewhere.[2]

5. Yield Indications.

Having obtained, in earlier work, some indication of the type of thinning which would be effective, this was repeated in Blocks 9, 10 and 11 when yields were also taken. The work was not arranged so as to obtain a proper analysis of yield, but the results, given in Table 4, afford some indication of the measure of crop regulation to be expected. They show that pre-drop thinning brought about a good degree of regular cropping compared with checks, the yields in the two-year period from regulated cropping approximating very closely those from biennial cropping. Comments on each block follow.

Table 4.—Regulation of Cropping by Pre-drop Thinning (Delicious Apple).

Treatment.	Season 1940-41.			Season 1941-42.			Average Yield per Tree in Biennium.
	Fruits per 100 Fruiting Spurs at Harvest.*	Yield (loose c/s.).	Average.	Per cent. Blossom.	Yield (loose c/s.).	Average.	
Block 9.							
Thinned 25 B	...	10	...	75	7½	...	...
,, 25 C	...	8	...	75	13	...	...
,, 25 D	...	6	...	60	10	...	...
,, 35 B	...	4½	...	50	15	...	...
,, 35 C	...	7	...	75	12	...	...
,, 35 D	...	5	6·7	90	8½	11·0	17·7
Check 1	...	15	...	50	2	...	...
,, 2	...	15	...	60	2	...	...
,, 3	...	15	...	10	6½	...	...
,, 4	...	11	14·0	5	11½	5·5	19·5
Bl ck 10.							
Thinned 20 C	201	8	...	10	3	...	...
,, 20 D	195	5	...	5	3½	...	...
,, 20 E	153	6½	...	10	3½	...	...
,, 34 (Heavy)	122	8	...	50	6	...	...
,, 34 ,,	124	11	7·7	20	5½	4·3	12·0
Check 1	...	11	...	0	20 apples	...	...
,, 2	...	13	...	0	8 ,,	...	...
,, 3	127	12	...	0	56 ,,	...	...
,, 4	124	8½	11·2	0	27 ,,	0·2	11·4
Block 11.							
Thinned 21 D	122	7½	...	90	4	...	...
,, 21 E	133	6½	...	90	3	...	...
,, 21 (Heavy)	143	8	...	90	3	...	...
,, 34 B	104	6½	...	75	3	...	...
,, 34 C	128	6¼	6·9	75	2½	3·1	10·0
Check 1	120	11½	...	50	3	...	...
,, 2	108	11¼	...	30	2¾	...	...
,, 3	...	8½	...	30	1½	...	...
,, 4	123	7½	...	30	1	...	...
,, 5	...	8¾	...	25	1½	...	...
,, 6	...	11	9·8	30	3	2·0	11·8

*NOTE.—This column shows, in Block 10, that the early elimination of competition between fruits by early thinning enabled much fruit to develop in pairs (201, 195 and 153 fruits per 100 fruiting spurs), whereas thinning a little later allowed longer competition between fruits, and many spurs then only developed singles (122 and 124 fruits per 100 fruiting spurs).

The latter figures were similar to the checks, in which the results were brought about entirely by natural sheddings. The comparison also shows that hand thinning must anticipate the natural sheddings if blossom buds are to be formed.

Comments.—Block 9 proved to be in the "heavy-and-light" condition and thinning halved the yield in the heavy year and doubled it in the light year, thus giving equal yields over biennium.

Block 10 proved to be in the "on-and-off" condition. Thinning evened up the cropping by reducing crop in the "on" year and yielding a fair crop in the "off" year, thus giving equal yields over the biennium. Note the high yields from the low percentage of blossom in the second year. This grower green manures and fertilizes heavily.

Block 11 proved to be in the "heavy-and-light" condition, and thinning reduced the crop in the heavy year and produced two to three times the blossom in the second year, from which the yield was only 50 per cent higher than checks. With a better setting a greater difference could have been obtained; probably lack of moisture was responsible.

6. Effect on Fruit.

The degree of thinning effected in these trials had the definite intention of reducing the number of fruits to the point where they would not be the complete drain on the tree which is made by "on-year" crops, thus enabling the tree to make better growth and to form blossom buds. In general, the effect on the fruit was beneficial, although it was apparent that picking maturity would require watching in such crops. The separate effects may be enumerated as follows:—

(*a*) Size was improved. The fruit of each tree in Blocks 1, 2 and 3 was weighed. Owing to the tree individuality that shows up in a dry autumn, as regards size, the effect on size is best shown by the range of mean weight (lb.) per fruit on all trees which is shown in Table 5.

Table 5.—*Range Between Trees in Mean Weight* (*lb.*) *per fruit.*

	Checks.	Thinned Trees.
Block 1	0·160 to ·200	·177 to ·270
Block 2	0·160 to ·200	·174 to ·260
Block 3	0·270 to ·300	·280 to ·370

(*b*) Size was more uniformly large.

(*c*) Improved size was obtained earlier in the season.

(*d*) Not only size, but internal maturity was obtained earlier. This was exemplified in instances where the entire crop was harvested in one picking from thinned trees before the first picking was made on check trees. This aspect would require close attention if apples were to be stored.

(*e*) Maturity was more uniform. As just previously stated, the thinned crop was mature at one picking, whereas "on-year" crops are often picked over, waiting for size and colour.

(*f*) Thinned trees showed improved colour earlier, and colour is important in both varieties used.

Supplementing the Effects of Thinning.

The experiments were carried out in dry seasons. For example, the rainfall registrations at Orange, compared with an average annual rainfall of 37 inches were as follow:—1938—24 inches; 1939—35 inches; 1940—21 inches; and 1941—26 inches. Lack of moisture can interfere with blossom bud formation and with setting, as pointed out in Tables 2 and 4 respectively.

Thus, from the point of view of the uncertain effect of the climatic factor on the result, as well as the heavy labour requirements, pre-drop thinning by hand was beyond the bounds of any wide scale application.

However, the tendency of pre-drop thinning to promote blossom bud formation was established experimentally and opened up possibilities in other directions, viz.:—

(*a*) Heightening the tendency by some other cultural means. Pruning of trees according to variety habits, heavy spur pruning prior to the "on-year," maintaining a good standard of soil fertility and supplementary watering are probably the main means of assisting thinning to regulate cropping.

(*b*) Supplementing the tendency by special pruning. In Winter Cole pear a method of using spurred laterals to overcome alternate cropping [3] is now widely practised, and trials were laid down at Orange in 1944 to ascertain if a similar method might apply to Delicious apple. Trees on which laterals have been developed are now appreciably more vigorous, but so far

the spurs on laterals have not been made to blossom out of step with the spur system and so have not broken the alternate habit.

On the other hand, maintaining a good proportion of laterals in young trees should delay the onset of irregular cropping.

(*c*) Setting the "light" crop is also important. Light blossom is regarded by some growers as an uneconomical proportion, and such light bloom is removed in order to have the tree completely fruitless and thus save spraying. In a case where this has been practised the trees have become very firmly fixed in the completely biennial habit. For the purpose of regulating cropping, however, it is most advisable to provide conditions which will set this crop as well as possible in order to ease the next "on-year." The results in Block 10 (Table 4) show that a light blossom can set to produce an unexpected yield, whereas in another block in the same year (Block 11) a much heavier blossom failed to set well. Cultural practices that secure ample moisture and nitrogen to the tree will undoubtedly assist in setting the light-year crop.

Excess Blossom a Useful Guide.

It is well known that a "balance" between leaf and blossom buds is necessary for regularity of cropping—this balance being achieved when about two-thirds to three-quarters of the buds that break in the spring are blossom buds and the remainder leaf buds.

Trees in their "on-year" are characterised always by a large excess of blossom. It is usually found that 80 to 90 odd per cent. of breaking buds are flower buds. That such blossoming is excessive has been demonstrated by these thinning trials in which removal of 75 to 80 per cent. of such "on-year" blossom still permits of good cropping.

Excessive blossoming may, in fact, be taken as a useful guide that some irregularity of cropping is pending. It may be the prelude to one or more unduly heavy crops, after which irregular cropping will supervene, and it seems to be the reason for noted regular croppers such as Jonathan, Granny Smith and Rome Beauty drifting into complete "on-and-off" bearing.

The importance of recognizing excessive blossoming lies in the fact that it is the tangible point of approach to the problem. If it is allowed to pass unchecked the trees may alternate in crop, and two years must then intervene before action can next be taken. Hormone sprays seem to be a useful means of checking the condition, and controlling the blossom in this way may be a good means of delaying the onset of alternate cropping.

Summary.

1. Hand-thinning trials with Delicious and McIntosh apples established that an early and drastic kind of thinning, called pre-drop thinning to distinguish it from ordinary thinning, was necessary to break the biennial cropping habit.

2. Fruit thinning has been effected by hormone sprays on a large experimental scale on some important varieties at negligible cost.

3. The thinning by hormone sprays being of a pre-drop nature also offers the possibility of bringing about a considerable degree of crop regulation in these varieties.

Acknowledgment.

The authors wish to acknowledge with gratitude the assistance of growers, rather too numerous to name individually, in the Batlow, Orange and Oakdale districts who have made trees available for the hand-thinning and spraying experiments and in the case of the latter have carried out the spraying in many instances.

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[3] WHITTAKER, E. C.—Pruning Winter Cole Pears. *Agric. Gaz.* 45, 443-5, 1934.

New Citrus Research Laboratory at Gosford.

A CITRUS research laboratory has been set up at Gosford to investigate the problems of production and storage of coastal citrus fruits. The laboratory was officially opened by Hon. F. J. Finnan, M.L.A., Minister for Labour and Industry and Social Welfare, on 25th October, and is a co-operative venture of the N.S.W. Department of Agriculture, the Council for Scientific and Industrial Research and the Gosford Bulk Loading Co-operative Society.

The Society has agreed to lease portion of its new packing house for the purpose and the New South Wales Department of Agriculture and the C.S.I.R. have entered into an agreement to carry out investigations on a co-operative basis and to bear the cost of establishing and equipping the laboratory.

The annual costs of running the laboratory have been arranged as follows:—The Department of Agriculture to appoint to the Division of Horticulture, a Fruit Research Officer and a Fruit Officer who will be stationed at Gosford. C.S.I.R. to be responsible for all other costs, such as power, water, steam, equipment and maintenance and the purchase of fruit.

Some years ago the C.S.I.R. and the Department set up a co-operative fruit processing and storage room and laboratory at the Abattoirs, Homebush, and jointly financed and staffed the investigations carried out there. This work, under the direction of Dr. J. R. Vickery, Chief, Division of Food Preservation, C.S.I.R., was supervised by a committee of representatives of C.S.I.R., Department of Agriculture and the University of Sydney, Mr. C. G. Savage, Chief, Division of Horticulture, being the Chairman. It is proposed that the same commitee will supervise the investigations at Gosford.

Proposed Investigations.

Among the investigations which it is intended to undertake at Gosford are the following:—

1. *Handling and Processing Treatments Designed to Reduce, or Eliminate, Attacks by Mould.*—These will include washing, fungicidal and waxing treatments, use of special wraps, and storage disorders other than those caused by fungi.

2. *Handling Factors.*—Methods of handling in the orchard, from the orchard to packing house, in the packing house, and design of washing, waxing and grading machines to reduce damage to the fruit.

3. *Prevention of Transit Disorders.*—Methods of packing, road and rail transport, stacking and ventilation of cases.

4. *Orchard Factors.*—Relationship between general cultural operations and orchard hygiene to the storage life of fruit.

5. *Treatment of Fruit for Removal of Scale.*

6. *Investigations relating to the Curing and Storage of Winter Lemon Crop.*

Arrangements are in hand to undertake small-scale research work in connection with this season's Valencia crop. Until it is possible to obtain the proposed staff, the research work will be undertaken by officers of the C.S.I.R. and the Department stationed at the Homebush laboratory. Cool storage facilities are available at Homebush for storing fruit under different conditions at various temperatures.

The Tropical Fruit Research Station.

THE Government had approved of financial arrangements for the erection of a tropical fruit research station on the North Coast, and the Banana Growers' Federation had made a generous offer towards the cost of the project.

Making this statement in the Legislative Assembly, Hon. E. H. Graham, M.L.A., Minister for Agriculture, said: "Officers of my Department have made a survey from Murwillumbah to Lismore to find a suitable site. As soon as a site can be found we will proceed to have the research station set up as soon as possible."

INSECT PESTS.

Notes contributed by the Entomological branch.

RED MITE (*Bryobia praetiosa*).

THE mite known to orchardists as red mite, is a common pest of pome and stone fruit trees, including apples, pears, almonds, plums, prunes, apricots and peaches. Delicious apples appear to be particularly susceptible to attack.

In addition to attacking fruit trees, these mites feed on clovers, lucerne, grasses and other plants. They are also known by the popular names of brown mite, almond mite and clover mite.

The winter is usually passed in the egg stage but the adults may also over-winter under stones. The over-wintering eggs, which are laid in the autumn, are spherical, red in colour and are deposited in a compact layer which forms a regular reddish covering over the bark. The favoured places for egg deposition are the junction of two limbs, the fruit and leaf scars and the fruit spurs. When the young mites hatch, the white egg-shells, together with cast skins of the mites, may remain on the bark for a considerable time, the egg-masses then having a whitish appearance.

At times the eggs may be laid singly, and in some districts many eggs may be laid on the ground and in any rubbish lying about the base of the trees.

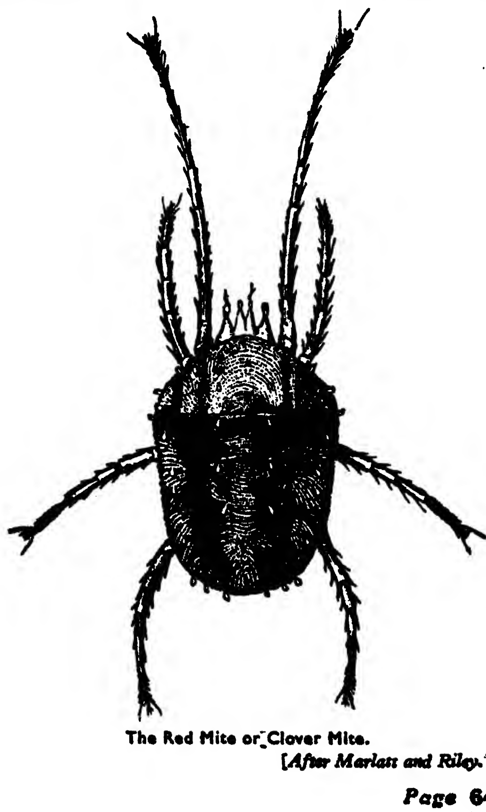
The eggs hatch in the spring, just before the buds open, and the young active, six-legged mites are bright red in colour. After the first moult an additional pair of legs is developed and the colour of the mites changes to brownish.

The adult mites, which measure about one-thirtieth of an inch in length, vary greatly in colour. Some may be reddish-brown, others grey or greenish-grey, and their legs may be orange or amber-coloured. They have four pairs of legs, the front pair being much longer than the others. This species does not spin a web.

The mites feed on the growing leaves and blossoms, usually congregating during the day on the young twigs and migrating to the leaves at night.

Where the eggs are laid in the soil, or amongst rubbish beneath the trees, the mites will feed on clovers, etc., until the plants have reached maturity and commenced to die out. They then migrate to the trees, and, in the Irrigation Area, this usually occurs during late October or early November.

These mites, at times, may migrate in considerable numbers from various plants, and



The Red Mite or Clover Mite.
[After Marlatt and Riley.

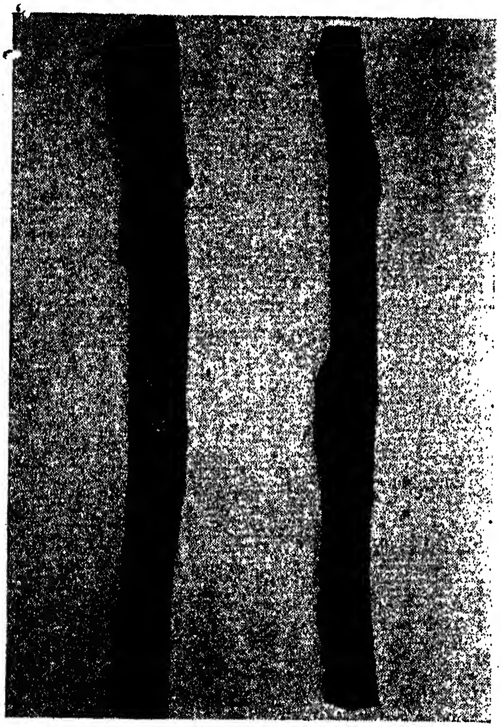
invade the lower rooms or basements of buildings in the vicinity.

CONTROL.

Winter Treatment.

Winter treatment is important where the deposition of eggs is heavy, in order to destroy them before they hatch.

Spray with a dormant or semi-dormant oil at a dilution of 1 gallon of oil to 20 gallons of water, or with lime-sulphur solution diluted to full winter strength, in accordance



Eggs of the Red Mite Deposited on Twigs of Plum Tree.

with the 2 per cent. column of the Dilution Table given in Spray Leaflet No. 3 (Lime-sulphur), which may be obtained from the Department. The approximate dilution will be 1 in 10 for a good grade commercial lime-sulphur solution, and 1 in 7 for a good home-made lime-sulphur.

The dormant oil must be applied before the buds begin to swell, but the semi-dormant oil may be safely applied at the bud-swell stage.

Spraying with lime-sulphur may be delayed with stone fruits until the buds are well swollen, and with apples and pears until the fruit spurs are bursting, and only just exposing the tops of the enclosed clusters of fruit buds, *i.e.*, the early spur-burst period.

Lime-sulphur sprays are not recommended for the control of red mite on almonds owing to the early blossoming (late July-early August) of these trees, before the mite eggs commence to hatch.

Special semi-dormant oils, now on the market, may be mixed with lime-sulphur, and a single combination of oil–lime-sulphur spray has advantages under some conditions. It is essential that the right type of oil be obtained and the directions of the manufacturer followed.

Spring and Summer Treatment.

If winter treatment has not been undertaken, or where numerous eggs have been deposited in the soil, apples and pears may be sprayed with lime-sulphur during the growing period, but the solution must be diluted according to the stage of growth the trees have reached, varying from full spur-burst to the pink (or colour) stage, *i.e.*, when the sepals have expanded to a small extent, and exposed slightly, the still folded petals. The spur-burst strength that may be used is shown in the ½ per cent. column of the Dilution Table in the abovementioned Spray Leaflet. The approximate dilutions are 1 in 44 for a good commercial or 1 in 28 for home-made lime-sulphur.

After the blossoming period the lime-sulphur should be reduced to summer strength—*see* 0.15 per cent. of the Dilution Table. The approximate dilutions would be 1 in 147 for a good commercial or 1 in 93 for home-made lime-sulphur.

Lime-sulphur alone, at these summer dilutions, is not satisfactory for the control of red mite, and earlier treatment is recommended.

The white oil sprays used for the control of codling moth on apples will give good control of red mite. With varieties such as Delicious, which are very susceptible to attack by this mite, early treatment should be given, otherwise the trees will be severely damaged prior to the codling moth sprays.

During the growing period, sulphur sprays, such as wettable sulphur 5 lb. to 100 gallons of water, or colloidal sulphur 2½ lb. to 100 gallons of water, are recommended for stone fruits such as prunes and

peaches and almonds. These sprays are best applied as soon as the mites have migrated from the ground to the trees.

The use of lime-sulphur on stone fruit trees during the growing period is not recommended, as spray injury may result.

The abovementioned sulphur sprays may be applied to pome fruits, in the cooler districts, during the growing period, with a fair degree of safety, but in the warmer districts, such as the Irrigation Area, sulphur sprays are liable to cause russet or scald if applied during very hot weather.

Promising results have been obtained with the new organic phosphate derivatives, such as HETP (hexaethyl tetraphosphate) at a concentration of ½ pint to 100 gallons of water (1 in 1,600). However, two applications, with an interval of ten to twelve days between, are necessary in order to obtain satisfactory control, as this chemical has no effect on eggs that may be present on the trees at the time of application.

This chemical is not compatible with alkaline materials such as Bordeaux mixture, lime-sulphur, calcium-caseinate, etc., and for best results a neutral wetter or spreader should be added. The spray mixture must be used promptly after mixing.

Where these mites are found to be entering a building they may be controlled readily with kerosene sprays, or on the plants outside with a lime-sulphur solution.

HOVER FLIES AND LADYBIRD BEETLES

(*Syrphidae* and *Coccinellidae*).

FROM about the middle of October and during November numerous reports were received from widely separated inland and coastal areas of the State of the occurrence of thousands of flies and small beetles. These were observed swarming over leaves and flowers and amongst grass, the flies rising in clouds when disturbed. On other occasions the flies were observed passing in continuous flight.

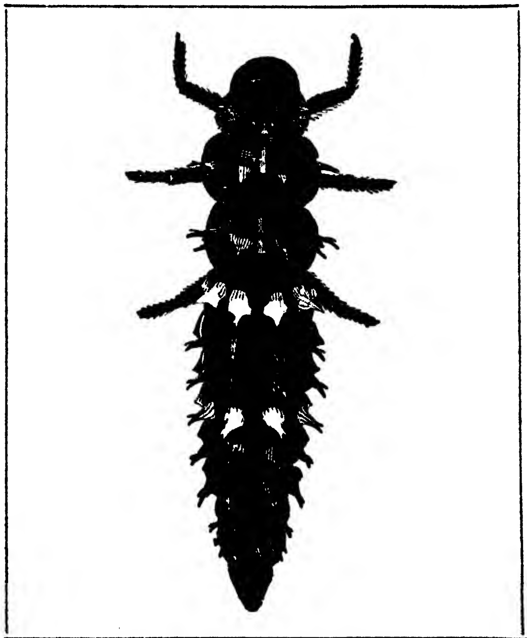
The flies were identified as *Xanthogramma grandicornis,* one of the beneficial hover flies, and the beetles as *Coccinella repanda,* a beneficial species of ladybird.

Following upon heavy aphid infestations, such as occurred widely over the State from early October and during November, hover flies occur in very large numbers, and, together with the aphid-eating ladybird beetles, play an important part in the destruction of the aphids.

The hover fly family (*Syrphidae*) in Australia contains some sixty species and the larvae or maggots of many are beneficial insects that feed upon aphids and other small insects. The adults of the common aphid-eating species have dark bodies, and yellow and black banded abdomens. On sunny days they may be seen hovering, almost motionless, in mid-air with their wings vibrating rapidly. This habit has given rise to their popular name of "hover fly."

The eggs of these flies are laid singly on aphid-infested plants, and the legless larvae or maggots which hatch later, crawl actively over the plants in search of their prey, from which they suck the body fluids.

The larva or maggot, which may measure up to ½ inch or more in length, is green to grey-brown in colour, and usually has a



Larva of a Beneficial Ladybird Beetle.

Adult and Larva or Maggot of the Common Hover Fly.

lighter marking along the centre of its back. When fully-fed, the maggot attaches itself to some part of the plant and the last larval skin hardens to form a yellowish or brownish pear-shaped puparium within which the larva enters its pupal or chrysalis stage. Later, the adult fly emerges through the end of the puparium, and the life-cycle is repeated.

With the exception of one group belonging to the genus *Epilachna* (leaf-eating ladybirds), practically all the other members of the large family of ladybird beetles (which in Australia contains more than 250 different species), are beneficial insects, which, in both their larval and adult stages, feed upon and destroy aphids, scale insects, mealy-bugs and other soft-bodied insects.

The eggs, which are spindle-shaped and yellow, are laid in clusters on the leaves and bark of aphid-infested plants.

The elongate, active larvae are dark-grey to black with orange markings. The larva, which measures about one-third of an inch in length when fully-fed, eventually attaches itself by the tip of the abdomen to the bark or a leaf of the plant. The last larval skin then splits and the larva passes into the pupal or chrysalis stage.

At times, following upon heavy infestations of aphids, the trunks and limbs of trees may become densely covered with ladybird beetle pupae.

The adult ladybird is hemispherical in outline and measures about 3/16 inch in length. The wing-covers are orange-yellow, each being marked with three irregular, black markings, the marking near the base of each wing-cover being of an irregular V-shape. There is also a dark irregular line down the middle of the back. The head, thorax and under-surface of the body are mostly black.

Berseem Clover—*continued from page* 638.

Seed Production.

As seed of Berseem clover is in short supply, farmers are urged to save their own seed where possible. For seed production the crop is cut with a mower when the greatest proportion of the seed is ripe in the head. A bundler is fitted to the back of the mower and the material is raked off this attachment into heaps in the field. It is inadvisable to use a hay rake, as the material breaks up readily and much seed is lost.

The material should only be left in the heaps long enough to dry thoroughly. The sooner it can be carted in the better, because it is very light and easily scattered by the wind. After stacking in a hay shed until tinder dry, the seed is put through a lucerne or other suitable seed thresher.

The material should be put through the thresher twice, to make sure of getting all the seed out of the heads. Straw from properly threshed material is of no use for stock fodder.

BEES can be worked more comfortably when weather conditions are favourable. The day should be bright and sunny, and the time selected for handling between 10 a.m. and 3 p.m. With judicious use of smoke an experienced beekeeper can open a hive at any time and under varying conditions, but even veterans endeavour to manipulate colonies when conditions are most favourable. In early spring, late autumn, when the weather is chilly, immediately after rain, or after a sudden stoppage of the honey flow, bees are inclined to be hard to handle. All actions around the apiary should be deliberate, avoiding quick unsteady movement.

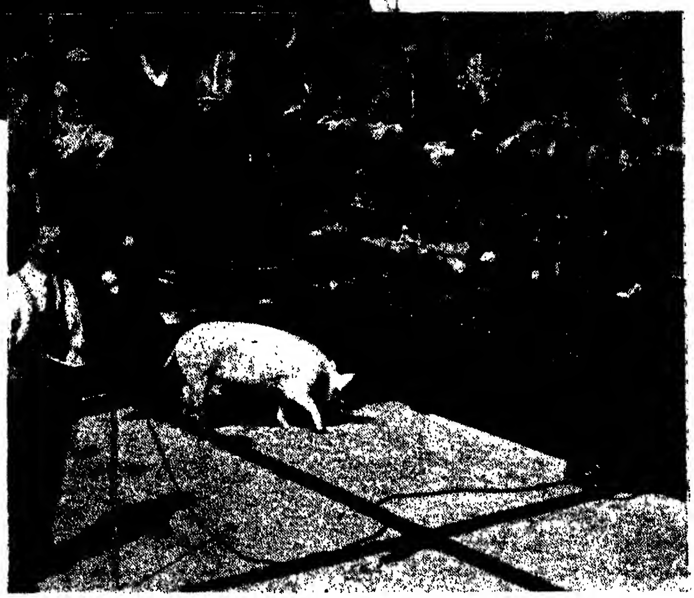
BACON PIG CARCASE COMPETITION

Conducted by the Australian Meat Board.

G. M. D. CARSE, H.D.D., Principal Livestock Officer (Pigs).

IN order to encourage the production of high quality bacon pig carcases suitable for export, the Australian Meat Board conducted a Bacon Pig Carcase Competition in each State throughout the Commonwealth.

To conduct the competition in New South Wales, an expert committee was formed, comprising representatives of producers, processors, Commonwealth Department of Commerce and Agriculture, N.S.W. Department of Agriculture, Royal Agricultural Society of N.S.W., and the Australian Meat Board. A total of £150 prize money was



Scenes from a Well-attended Field Day at Macksville Co-operative Meat Works.

Conducted to enhance the educational value of the competition.

Above.—Judge dealing with Questions by Competitors after the Judging.

Right.—Judge Demonstrating on Live Pigs before Slaughter.

LIST OF PRIZE WINNERS.

Prize.	Exhibitor.	Breed of Pig. Sire.	Breed of Pig. Dam.	Marks Awarded.
	State Championship.			
1st	A. L. H. Stewart, "Hillcreston," Nimbin.	Berkshire ...	Berkshire	89½
2nd	P. J. Scheibel & Son, "Sunlight" Stud, Goolmangar, via Lismore.	Berkshire ...	Berkshire	85½
3rd	H. W. Morrow, "Willena," Booyong ...	Large White...	Large White–Berkshire Cross	83
	No. 1 District.			
1st	A. L. H. Stewart, "Hillcreston," Nimbin.	Berkshire ...	Berkshire	89½
2nd	P. J. Scheibel & Son, "Sunlight" Stud, Goolmangar, via Lismore.	Berkshire ...	Berkshire	85½
3rd	H. W. Morrow, "Willena," Booyong ...	Large White...	Large White–Berkshire Cross	83
	No. 2 District.			
1st	J. Sharkey, Missabotti, Bowraville ...	Berkshire ...	Berkshire–Tamworth Cross ...	81½
2nd	J. Sharkey, Missabotti, Bowraville ...	Berkshire ...	Berkshire–Tamworth Cross ...	78½
3rd	H. Garside, "Calderwood," Dartbrook, Aberdeen.	Large White...	Large White–Tamworth–Berkshire Cross.	76½
	No. 3 District.			
1st	A. C. Lawson, "Birkenhead," Carters Road, Dural.	Tamworth ...	Berkshire	79
2nd	Watkins & Fischer, New Line Road, Dural.	Tamworth ...	Berkshire	77½
3rd	Department of Agriculture, Yanco Experiment Farm.	Berkshire ...	Berkshire	75

offered by the Board, and the response by breeders was most encouraging, a total of 123 entries being received.

The competition was divided into three district competitions, and State Championship prizes were also awarded on the results. Judging was carried out by the writer, using the Hammond System of Carcase Appraisal.

The competition ran from 1st July to 1st October, 1948. Pigs entered had to be sired by purebred boars, but not necessarily out of pure-bred dams. Carcases had to weigh between 120 lb. and 180 lb. dressed weight; each competitor was allowed to make two entries of one carcase in each entry.

The accompanying table summarises the results. It shows that 31 per cent. of the carcases scored 70 marks and over, gaining First Class Certificates. Another 37 per cent. scored between 60 and 69 marks, to gain Second Class Certificates. The quality of those carcases, representing in all 68 per cent. of the total entries, reflects credit on our leading breeders for their work in fixing the type of live pig they have evolved.

TABLE SHOWING SUMMARY OF RESULTS.

Quality Grading.	No. of Entries.	Marks awarded (Maximum 100).	Percentage of Total Entries.
			Per cent.
Excellent	6	80 to 89½	5
Very good	32	70 to 79	26
Good	45	60 to 69	37
Fair	18	50 to 59	14
Poor	17	40 to 49	14
Unsuitable for trade ...	5	Below 40	4

What the Competition Showed.

The competition has shown—

1. A large number of strains in the various breeds throughout New South Wales are capable of producing bacon carcases of good quality.

2. Many of the carcases, however, showed evidence that their standard of quality could have been improved by application of

(Continued on page 666.)

Part of Hawkesbury College Apiary.

APIARY NOTES

MANAGEMENT IN A RECORD SEASON

To Achieve Maximum Quality.

W. A. GOODACRE, Principal Livestock Officer (Apiculture).

THE beekeeping industry is making good progress in New South Wales. Statistics show that for the year ending 31st March, 1947, slightly over 9,000,000 lb. of honey was produced, and last year's production amounted to nearly 10,000,000 lb. This year, substantial progress has already been made in extraction of honey, and with excellent honey-flow prospects still offering on the flora, it is estimated that a further record production of 12,000,000 lb. will be gained in New South Wales. This is about 5,500 tons.

Features of This Year's Record Production.

An important feature of this year's production is that the bulk of honey being produced is of choice quality. As a matter of fact, heavy yields of choice honey have already been secured from Mugga Ironbark (*Eucalyptus sideroxylon*)—that dark, rugged tree of the Tablelands with white to scarlet-coloured flowers—and also from that picturesque hardwood, the White Box (*Eucalyptus albens*), which occurs mainly on the hilly country of many inland districts.

To flower after these two species, we have the famous Yellow Box (*Eucalyptus melliodora*), Australia's best honey tree, which occurs particularly on the elevated country of the Central Tablelands, which budded heavily this year; its flowering period is from November to January inclusive. Yellow Box trees are most reliable for production of honey, and it is not uncommon, in well-managed apiaries, to extract an average of four 60 lb. tins of choice honey per hive from one good flowering of the species.

Migratory beekeepers should not find it necessary to move their hives about the country so much this year, and this will certainly be appreciated. The only moves anticipated are from the Ironbark and White Box country, where the majority have lately been operating, to sites on the tablelands where Yellow Box trees will flower. Then during autumn a move to the coast may be considered to contact a possible flowering of Bloodwood (*Eucalyptus corymbosa*), or to establish apiaries on selected coastal wintering sites.

Pollen Substitute Fed Dry Outside the Hive.

Large Amount to be Exported.

Information has been received from the Department of Commerce and Agriculture to the effect that the British Ministry of Food has agreed to issue licenses for the importation of 12,000 tons of Australian honey for the year ending 30th June, 1949. This is very welcome news, as export of this substantial quantity of honey will do much to relieve congestion on the markets of our three main exporting States. Producers hope, of course, that no serious difficulties will arise in regard to supply of export containers for the honey, or provision of shipping space.

Working a Yellow Box Flow.

Special care must be exercised in management during the working of a honey-flow from Yellow Box. For instance, this species, although famous as a honey tree, does not produce any useful supply of pollen. Because of this, this nitrogenous food, so essential to sustain brood-rearing in the hives, must be secured from some other floral source, or by the beekeeper feeding a satisfactory pollen substitute.

Without an adequate supply of pollen, the population of the hives will surely become reduced and thereby lessen the honey-producing capacity of the colonies. To minimise risk of trouble in this direction, beekeepers should give careful attention to the following points:—

(*a*) Do not establish apiary sites too close to one another. Liberal spacing of apiaries will allow of a better distribution of available natural pollen supplies.

(*b*) Should a shortage of natural pollen become evident, do not delay in feeding a suitable substitute such as soya bean flour and dried skim milk, four parts of the flour to one part of milk. The mixture may be fed dry in the open, or in paste form inside the hives. To make the paste, mix 1 lb. of the substitute with 1 quart of sugar syrup made with two parts of sugar to one of water.

Quality of Coastal Honey.

Many people have gained the impression that honey from the coastal regions is not of good quality. This is not correct as many types of coastal honey are of choice quality, notably those from such eucalypts as Grey Ironbark, Broad-leaved Ironbark and Woolly Butt. Some useful quantities of clover honey also come in from the northern coastal river country.

It may be that the wrong impression concerning coastal honey has been handed down from the early days, when beekeeping was mainly confined to areas near the seaside, and production was secured from tea trees, heath plants and banksias. Honey produced from these plants is rather dark in colour and of strong flavour. Seaside areas where these species predominate are now found to be of greater value for wintering bees than for honey production.

Common Faults in Honey Flow Management.

With the development of extensive migratory bee-farming, which involves a special knowledge of the honey and pollen value of the various species of trees and plants, the beekeeper has an excellent opportunity of selecting apiary sites on country where higher grade honey can be produced. It is important, of course, from the marketing

angle, that as much choice honey as possible be produced, even if this necessitates moving a further distance to contact honey-flows.

Apiary inspections carried out during this year have disclosed two fairly common faults in apiary management during honey-flows, which should be avoided in future. One fault is that extracting work is rushed, the combs of honey from the hives being extracted before the bees have sufficiently capped the honey in them. The other is that extracting work is unduly delayed, and the hives become so congested with honey that the queen has little space for brood-rearing; it was evident in such cases that at least one good extraction of honey had been lost.

Much of this trouble could be avoided if extracting work was carried out on a systematic basis. For instance, the larger beekeepers would not find it necessary to rush extracting work if provision were made to build up an ample supply of additional supers of combs. These could be placed on hives in apiaries awaiting extraction. With this ample super accommodation available, beekeepers would not fear loss of production—which influences them to extract too early from the first two or three of their apiaries.

On the other hand, the young beekeeper is often inclined to delay extracting work unduly; he is concerned about the future, and the possibility of leaving the colonies short of stores. Anxiety in this direction can be relieved by working to a system whereby, when one apiary is due for extraction, bees in another apiary have a good reserve of honey stores. Where only a few hives are kept, the work should be done systematically so that half the number of hives can be extracted whilst the remainder have ample reserves. Such reserves are an insurance against sudden cessation of supplies from the fields, and can be drawn upon for transfer to needy colonies in case of emergency.

IMPORT REQUIREMENTS FOR QUEEN BEES.

THE Director of the Division of Veterinary Hygiene of the Commonwealth Department of Health has drawn attention to a recent instance in which queen bees were imported into Australia without complying with the requirements of the quarantine regulations, and has indicated the procedure which is necessary where such importations are made.

The incident was reported by the Chief Quarantine Officer (Animals), Brisbane, and concerned the importation of queen bees from France in contravention of Quarantine (Animals) Regulations.

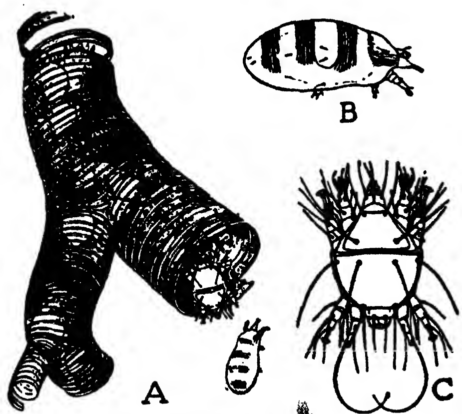
The circumstances were briefly as follows:—

A Queensland apiarist (an honorary inspector under the Apiarists Act) notified the Chief Quarantine Officer (Animals) Office that he had received, by post, two queen bees from France, having taken delivery at the local post office. The parcel was unregistered and the postal authorities had no notion as to its contents.

It appeared that the bees were brought by plane from France to Sydney, either with a passenger or as mail, and were reposted from Sydney to Queensland. No permit to land was issued by Chief Quarantine Officer (Animals), Sydney, who is making further inquiries as to their mode of entering the country.

The bees were seized and destroyed by the Chief Quarantine Officer (Animals), Brisbane.

The Director points out that this instance demonstrates that, in spite of the quarantine safeguard, it has been possible to import



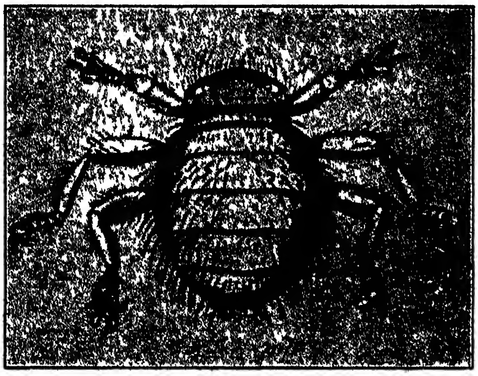
Acarine Disease Mites and Infested Trachea.
Occurs in European countries but not in Australia.
[*After Snodgrass.*

bees without complying with quarantine requirements.

The apiarist had no knowledge of these requirements but reported the incident because he thought there were possibly some conditions to be fulfilled.

Considering that most apiarists, in their own interest, would readily comply with the quarantine procedure if they knew what was required of them, the Director has supplied the following statement:—

The quarantine service of the Health Department, working through its Chief Quarantine Officers (Animals) and Quarantine Officers in each State, administers quarantine legislation with respect to bees, etc. This legislation provides that only queen bees and their escorts may be imported from overseas subject to compliance with the following requirements:—



Braula coeca, the Bee "Louse" (greatly enlarged). Occurs in Tasmania but not on the Mainland of Australia. [From the *American Bee Journal*.

The queen bee and a small escort must be consigned to the Chief Quarantine Officer (Animals) of the State of importation and be accompanied by—

(*a*) a declaration by the owner stating that they are free from disease and that they are from an apiary that is free from disease, and

(*b*) certification from a Government Veterinary Surgeon or other Officer whose duties relate to Apiculture in the exporting country, certifying that the bees are from a disease-free area and that Isle of Wight disease (Acariasis) does not exist within that country or in any apiary within 20 miles of that in which the bees are kept.

Unlike other "animals" listed under the Quarantine Act, bees may be imported by air and, in fact, this is their usual mode of travel.

On arrival, the cages containing the queens and their escorts are opened one at a time in a glass and gauze cage by a specialist, and fifteen to twenty (if available) of the foreign escorts are selected at random from each cage for dissection and microscopic examination. The queen is examined under a magnifying glass, and if she and her escort are found healthy, she is placed in a new cage with a fresh escort and suitable food. The old cage, escort, food, etc., are then burnt, and a permit is issued for the release of the queen.

If, on the other hand, the bees are found to be diseased, they are destroyed by burning together with their cages, food, etc.

In 1943 it was found that certain Tasmanian apiaries were infected with *Braula coeca,* and for this reason special quarantine conditions were imposed on bee exports from Tasmania to the mainland. These include certification of freedom from disease by a Government Veterinary Surgeon or Apiary Inspector.

The importation of used or second-hand bee-hives from overseas is totally prohibited.

These precautions, the Director points out, are taken to protect the Australian bee industry against the introduction into this country of *Braula coeca* infestation, Acariasis and Nosema disease, which are proclaimed diseases under the Quarantine Act and any other diseases which may endanger the welfare of the beekeeping industry.

MILK drawn during fifteen days before and five days after parturition, and in rare cases up to ten days after, should never be mixed with the remainder of the milk from a herd. Such milk, however, is necessary for the well-being of the calf and should not be withheld from it during the first five days of its life. The formation of a considerable clot after boiling indicates that the milk is still abnormal and unfit for human consumption, but when this clotting is replaced by the usual thin skin on boiling, the milk is in a fit condition to be included with that of the remainder of the herd.

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—Says JOE McCUBBIN, GREENKEEPER

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The weed absorbs "Methoxone" which causes a serious physiological disturbance owing to the high concentration of the hormone in the plant.

SECOND STAGE
The stem thickens and leaves become twisted & contorted.

THIRD STAGE
The foliage changes colour and the weed dies. Meanwhile, grasses also sprayed are completely unharmed.

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Poultry Farmers Listening to Addresses at Seven Hills Experiment Farm Field Day.

POULTRY NOTES

THE FIELD DAY
at
SEVEN HILLS POULTRY EXPERIMENT FARM.

THE Third Field Day at the Poultry Experiment Farm, Seven Hills, was held on 11th November and was attended by more than 200 poultry farmers and visitors.

The Farm has an area of 42 acres with a plant to accommodate 4,800 birds (exclusive of brooder houses and rearing pens) and is devoted to experiment and research work into poultry raising problems. It was crowded with visitors throughout the morning and afternoon sessions. Great interest was shown in the pens in which the various experiments are being carried out and in the addresses given by officers of the Department and officials of poultry farmers' organisations.

The official opening was performed by Hon. E. H. Graham, M.L.A., Minister for Agriculture, who was accompanied by senior officers of his Department, including Dr. R. J. Noble, Under-Secretary and Director, Mr. W. L Hindmarsh, Chief, Division of Animal Industry, Dr. H. G. Belschner, Deputy Chief (who acted as chairman), and Mr. Graham Edgar, Director of Veterinary Research.

In addition to the Manager of the Experiment Farm (Mr. D. Duncan) and his staff, there were present also, Mr. E. Hadlington, Principal Livestock Officer (Poultry) and Messrs. Brann, Hart and Gulliford, Poultry Livestock Officers, and Mr. L. Hart, Veterinary Research Officer, so that ample opportunity was afforded visiting poultry farmers to obtain any information they desired relating to the work at the Farm or on their own poultry farm problems.

Poultry farmers' organisations were well represented by Mr. P. Ryan, President of the Associated Poultry Farmers of Australia, Mr. A. Boddington, Secretary of the Association, and Mr. F. A. George, President of the Hatcherymen's Association.

The Official Opening.

Officially opening the Field Day, Hon. E. H. Graham, M.L.A., Minister for Agriculture, said he hoped to make the function an annual one. Much work had been carried out since the Farm had been given over to research, and every effort would be devoted in the future to developing an institution that would compare with similar stations overseas.

He had recently arranged for the establishment of a research farm at Tamworth, said Mr. Graham, and part of it would be devoted to investigations into poultry problems of that area. Poultry research had not kept pace with the rapid development of the industry, but it was hoped to carry out a good deal of research in the next few years. The industry should benefit greatly from the experience of two research officers at present studying poultry problems overseas.

Shortage of materials was still a problem. The Minister said he had been able to arrange recently for an officer of his Department to become a member of an advisory panel, together with a member of the Egg Board, to work in collaboration with the Department concerned in the allocation of materials to primary industries.

Mr. Graham said that the full effect of the recent increase in the price of eggs for export and the benefits of the Egg Marketing Board stabilisation scheme had not yet become fully apparent. He mentioned that producer representatives on the Board had recently been increased from three to five members. As Minister, he looked to the Board for guidance on matters affecting the marketing of eggs. It was a guiding principle of the Government that it sought the advice of representatives elected by the industry. Mr. Graham said he had arranged a conference between the Egg Board and the Associated Poultry Farmers of Australia representative, under the chairmanship of a Departmental officer, to discuss matters in connection with the Federal Egg Pool surplus.

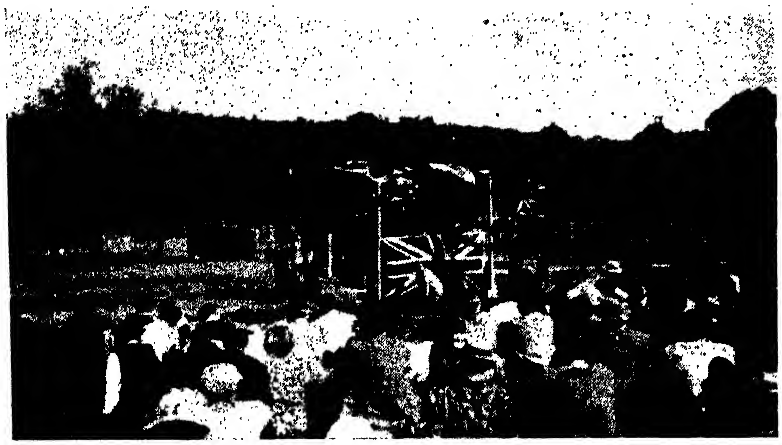
A vote of thanks to the Farm Manager (Mr. Duncan) and the Department of Agriculture for affording poultry farmers the opportunity to inspect the work being conducted at the Farm was moved by Mr. R. Ryan, President of the Associated Poul-

FEW people realise the work and organisation involved in carrying out a poultry research experiment. An exhaustive survey of existing data bearing on the problem is made and a plan of experiment is discussed and finalised by the Poultry Research Committee. This committee consists of the Deputy Chief, Division of Animal Industry; Director of Veterinary Research; Principal Poultry Officer; Senior Veterinary Research Officer; Biometrician, and the Manager of the Farm. According to the nature of the experiment involved, other specialists are co-opted as necessary, such as a geneticist for progeny testing, a chemist for nutritional experiments, and an agronomist in other instances.

The following will give some indication of the extent of the detailed work involved in carrying out an experiment. In one single hatchability experiment, designed to determine the value of synthetic riboflavin as a replacement for milk powders, etc., owing to the acute shortage of these supplies for breeding stock, 240 *birds were leg banded and trap nested in thirty different pens;* 11,341 *eggs were individually identified and this identification carried through fertility testing, hatching and rearability of the chickens; eight different rations totalling* 6,000 *lb. of analysed feed were prepared and issued in* 408 *lots and each bird was handled on an average of* 105 *times—a total of* 31,500 *handlings; not to mention the enormous task of maintaining accurate records of egg production, fertility, hatchability, etc., for each individual bird, and feed consumption for each pen.*

With the completion of the actual field work there follows the work of summarising the records and making a statistical analysis of the data—and finally evaluating and publishing the results in a form to suit the requirements of poultry farmers.—Extract from the Poultry Experiment Farm Field Day Booklet.

try Farmers of Australia, who indicated the great increase which had been made in the industry during recent years. The resolution was seconded by Mr. F. A. George, President of the Hatcherymen's Association, who impressed upon the poultry farmers present that the Poultry Experiment Farm was to be regarded as an integral part of the poultry industry. Expressing appreciation of the work of the present staff at Seven Hills, he pointed out that the investigations were handicapped by lack of trained staff. Projects undertaken must have practical application, he said and suggested that practical poultry farmers be invited to confer with Departmental officers for this purpose.



Hon. E. H. Graham, M.L.A., Officially Opening the Field Day.

Visitors Inspecting the Experiment Pens.

Mr. Bruce, who recently returned from a trip overseas as a Progressive Farmer, spoke in support. He said that great progress had been made in Canada in recent years because of research conducted into labour-saving methods—particularly the use of intensive housing. Mr. Bruce suggested that there was great urgency for local research along these lines, particularly into intensive methods and the use of electric light, for it was vital that costs of production be reduced. He predicted a great increase in table poultry production, particularly by the use of cross-bred birds—a world-wide trend. In this connection, also, labour costs must be reduced, he said, so that returns to poultry farmers would be comparable with those obtained by persons engaged in other industries.

The Experiment Work Described.

During the afternoon, brief addresses were given by Mr. Graham Edgar, Director

of Veterinary Research, and Mr. L. Hart, Veterinary Research Officer.

A General Survey.

In an outline of the work carried out since the Farm was first devoted to research and experiments, Mr. Edgar described the riboflavin and vitamin A hatchability trials results of which are available as Poultry Extension Bulletins Nos. 1 and 3, respectively), and also the single grain feeding and feeding systems trials, the high and low protein rations for chickens, the toxicity of linseed meal for chickens, grain sorghum for chickens and laying stock and the hormone fattening of poultry experiments.

Among other experiments completed or in progress, described by Mr. Edgar, were the following:—

Use of Stilboestrol for Desexing Cockerels.—An attempt has been made to prevent the development of testes in cockerels by dosing by mouth at day-old with the hormone stilboestrol. Progress results indicate failure.

Weed Seed Toxicity Test.—During the year experiments were conducted on the poisonous effects of weeds on poultry with the following weed seeds:—Dock, Thorn apple, Marshmallow, Mustard weed, Noogoora Burr, Bathurst Burr, Mint weed. While none was found to be lethal, Marshmallow, Dock, Bathurst Burr and Noogoora Burr had a depressing effect on egg production. Discretion should be exercised in the use of grains and feeds contaminated with these seeds.

Palatability of Grain Sorghum.—The birds were fed the following sorghum grain both in a whole and ground state:—Hegari, Milo, Plainsman, Kalo. In both cases consumption of Hegari was approximately 60 per cent. higher than other grains. This matter is to be further examined.

Thyroprotein for Stimulating Egg Production.—American work has indicated that by including thyroprotein in the ration of fowls three to six years of age, increased production results. Even birds two years of age which had been fed thyroprotein for more than a year produced better than the controls. Our experiment was designed to determine whether feeding thyroprotein would improve autumn egg production in first-year hens or improve shell texture. Neither egg production nor shell quality was affected.

Progeny Testing.—It has become evident from practical experience and research that the present widely used methods of selection of stock for breeding are not improving flocks to any degree. It is now recognised that only by progeny testing, *i.e.*, testing the progeny of each sire for actual results to indicate how they are breeding, can any further improvement be made. A large scale progeny testing project has been initiated at this Farm, the purpose being to develop practicable methods of progeny testing for application on commercial lines and for producing progeny tested stock for sale to the public.

WHITE LEGHORNS.

In 1946 twenty White Leghorn cockerels were singly mated with twenty lots of twelve White Leghorn hens and the first generation from these sires have been tested for egg production, egg weight, mortality, economy of food utilisation, etc. Four sires, which were assessed to have given the best results, have been mated to their daughters to inbreed these strains, the progeny of which will be fully tested in 1949.

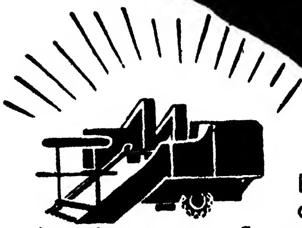
This year the progeny of ten White Leghorn cockerels (hatched from eggs of the progeny tested stock imported from the Beltsville Animal Husbandry Station of the United States Department of Agriculture) which were mated to our own stock in 1947 are now being tested for their top crossing or hybrid breeding factors. The females bred from the imported eggs are being inbred to maintain the pure American strain.

AUSTRALORPS.

Thirty of the progeny from each of the ten groups of Australorps mated to ten sires in 1947 are now being tested for egg production, egg weight, viability and economy of food utilisation, etc.

Limestone Feeding Experiment.—Owing to the shortage of shell grit, which has been the usual form of calcium available, this experiment is being conducted to test out the value of limestone chips and limestone powder as a substitute; 160 hens are being used, being divided into sixteen groups of ten birds. There are four treatments, viz.:

DO YOU HARVEST BY THE OUNCE?



Every single ounce counts if you're harvesting flower seed. It's a touchy operation. You know if your equipment can master this one, it can save many extra pounds of other types of seeds, such as grasses, legumes, small grains, peas and beans. The Allis-Chalmers ALL-CROP Harvester is the uncanny machine which is successfully handling thousands of acres of flower seeds, from sweet peas to tiny, fine-screen petunia seed.

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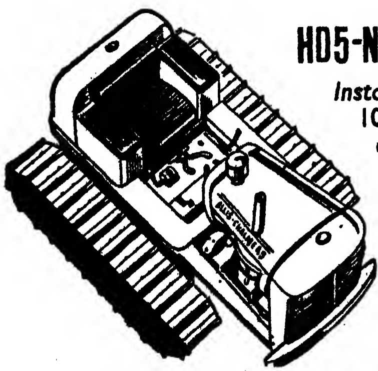

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(1) Limestone chips; (2) Limestone powder; (3) Shell grit; and (4) controls. In all groups food consumption and grit consumption are being recorded and each bird is individually trapped for production.

Oat Grain Feeding Experiment.—Owing to the restricted supply of wheat for poultry feeding during the past few years, it has been necessary partly to substitute oats, and some producers have been reluctant to use this cereal owing to its high fibre content.

In order to obtain definite data on the effect of oat feeding an experiment has been designed as under:—

All groups have dry mash and the grain rations is fed as follows:—(1) Wheat (controls); (2) oats and wheat equal parts; and (3) oats only.

Vaccination Against Spirochaetosis (Tick Fever).—A vaccine which effectively immunises fowls against tick fever has been developed at the Veterinary Research Station, Glenfield. Immunity lasts for at least a year. Owing to limited accommodation at Glenfield two groups of birds are being held at Seven Hills and birds will be taken to Glenfield from time to time and tested to determine the duration of immunity.

The 1947 Hatchability Trials.

Mr. L. Hart, Veterinary Research Officer stationed at Glenfield Veterinary Research Station, in his address, gave further details of some of last season's experiments.

Dealing with the hatchability trial, he said that the 1946 experiments demonstrated the importance of adequate riboflavin for maximum hatchability. There was some indication, however, that some other factor or factors essential for maximum hatchability was supplied in adequate amount by a combination of oil meals such as peanut, linseed and coconut meal and green feed.

The 1947 hatchability experiment was planned to answer this question. Groups were fed rations supplemented with liver meal, buttermilk powder, and whey powder, the basal ration being adequately supplied with synthetic riboflavin and vitamin A.

Results had not been analysed, he said, but it appeared that the addition of liver meal, whey powder or buttermilk powder to a ration otherwise adequate in riboflavin exerted no beneficial effect on hatchability.

The effect of blood meal on hatchability was also tested. The experiment was squeezed in towards the end of the hatching season when hatchability was normally

The Farm Manager (Mr. Duncan) Discusses a Bird with Poultry Farmers.
Hon. E. H. Graham and A.P.F. of Australia Executive are interested spectators.

declining. No adverse effect was shown but as hatchability of the control was depressed, the significance of the result was in doubt.

Grain Sorghum Trials.

Speaking of the grain sorghum trials, Mr. Hart said results in 1946 indicated that in trials with rations consisting mainly of wheat or of sorghum, wheat was superior to sorghum for chickens.

In 1947, varying amounts of grain sorghum replaced wheat in a conventional all-mash ration and the effect of added manganese was examined as it was considered that the poor results in the feeding of sorghum in 1946 may have been due to a low manganese content of the sorghum. The results showed that grain sorghum was unsuitable for chickens.

In trials with grain sorghum for laying hens, tests were made of:—

1. Conventional dry-mash incorporating 46½ per cent. wheat meal and wheat in the afternoon.

2. Crushed grain sorghum replacing the 46½ per cent. wheat in the mash and grain sorghum in the afternoon, replacing wheat.

Egg production of the birds in these groups was comparable.

List of Qualified Chick Sexers.

DURING the 1948 season two chick-sexing examinations were conducted by the Department and four candidates qualified for Certificates—one for Special Class and three for First Class.

The following is a list of holders of certificates issued by the Department, including those who qualified this season.

Special Class Certificates.

Mr. F. D. Evans, Leamington-street, Dundas.

Mr. S. W. Leach, Windsor-road, Baulkham Hills.

Mr. A. L. B. Newton, Blacktown.

Mr. N. B. Davies, Garnet-road, Miranda.

Mr. O. B. Johnson, 52 Dickson-avenue, West Ryde.

Mr. R. W. Druce, Old Prospect road, Wentworthville.

Mr. R. A. Percival, 135 Longueville-road, Lane Cove.

Mr. S. Martin, Duggan Farms, Blacktown.

Mrs. O. B. Johnson, 52 Dickson-avenue, West Ryde.

Mr. S. G. Olsson, Western-road, Wentworthville.

Miss B. B. Brown, Green's-avenue, Dundas.

Mr. J. Edwards, 74 Grantham-road, Seven Hills.

Mr. C. R. Sims, 5 Millar-street, Drummoyne.

Mr. H. D. Brown, Braeside-road, Wentworthville.

Mr. G. A. Lee, 60 Beaufort-street, Croydon Park.

Mr. R. G. Amies, Windemere-avenue, Northmead.

Mr. K. L. Moore, 5 Daisy-street, Chatswood.

Mr. B. J. Dawson, Withers-road, Kellyville.

Mr. A. Pamment, 75 Harris-street, Guildford.

Mr. A. E. Sutton, 65 Bungaree-road, Wentworthville.

First Class Certificates.

Mr. A. A. Tegel, Leppington.

Mr. C. R. Badman, Mackenzie-street, Revesby.

Mr. J. R. Kilborn, 9 Denman-street, Eastwood.

Mr. E. Marchant, Melbourne, Victoria.

Mr. W. Evans, Leamington-street, Dundas.

Mrs. F. D. Evans, Leamington-street, Dundas.

Mr. C. C. Green, 82 Carlingford-road, Epping.

Miss V. Wilson, Box 249 P.O., Newcastle.

Mr. H. Jacobs, Vimiera-road, Eastwood.

Mr. I. A. Hazlett, Ingleburn.

Mrs. A. Brakell, Church-street, Carlingford.

Mr. K. Gibson, Wensley House, Stanford Park road, Mt. Roskill, Auckland, New Zealand.

Mr. Gordon Thomson, Opoho, Dunedin, New Zealand.

Mr. J. H. Turner, Hotham-road, Sutherland.

Mrs. T. M. Brown, Main-road, Kearsley, via Cessnock.

Mr. J. Herrman, 86 Station-street, Fairfield.

Mr. H. Wallaste, Grantham-road, Plumpton.

Mr. O. Van Stappen, Pacific Highway, Wyong.

Mrs. H. M. Leach, Windsor-road, Baulkham Hills.

Mr. A. M. Smith, Richmond-road, Blacktown.

Mr. A. H. Baker, 13 Marion-street, Harris Park.

Mr. R. Pitt, Government-road, Weston.

Mr. O. Korting, Bid-a-wee Poultry Farm, Quaker's Hill.

Mr. R. O. J. Clucas, Excelsior-avenue, Castle Hill.

Mr. K. J. Fooks, Tomah-street, Carlingford.

Mrs. Z. Jacobs, Kildare-road, Doonside.

Mr. N. Long, Ferndell-street, Guildford.

Mr. R. Lockyear, Hurt-street, West Wollongong.

Mr. G. E. Mahon, Kings-road, Ingleburn.

Mr. R. J. Mayjor, 106 Ballandella-road, Toongabbie.

Mr. F. S. Wrigley, 1 Blencairn-avenue, Caulfield, S.E. 7, Melbourne.

Mr. R. Clark, Bay-road, Arcadia.

Mr. S. G. Gibson, Richmond-road, Marsden Park.

Mr. R. Watson, 4 West Terrace, Bankstown.

Mr. R. C. Parkin, 3 O'Neil-street, Granville.

Miss N. Nall, Herring-road, Eastwood.

Mr. D. Melville, c.o. Leach's Hatchery, Windsor-road, Baulkham Hills.

Mr. J. R. Clucas, Old Northern road, Castle Hill.

Mr. C. M. Whitehead, Addison-road, Manly.

Mr. W. G. Savage, Oak-road, Sutherland.

Second Class Certificate.

Mrs. W. J. Hanley, 219 Princes Highway, Charlestown.

Standards for Certificates.

Particulars of the standards for the various certificates are as follows:—

For a Special Class Certificate, it is necessary to sex 300 White Leghorn chickens in 45 minutes with 98 per cent. accuracy, without killing or injuring a chicken.

For a First Class Certificate, 200 White Leghorn chickens must be sexed in 30 minutes with an accuracy of 95 per cent. Not more than one chicken can be killed or two injured without disqualification.

The Second Class Certificate, which has now been discontinued, was introduced as a wartime measure in order to enable more sexers to qualify to meet the increased demand. The standard was the same as for First Class except that 50 minutes were allowed for sexing the 200 chickens. Several candidates qualified for this certificate and later gained First Class Certificates.

The Position Regarding Sexers.

At the present time there are sufficient sexers to cope with most of the sexing in the main commercial poultry farming centres of this State, but some small farmers are still not able to obtain the services of sexers because of the small number of chickens handled and the distance apart of the farms.

The services of the Special Class Certificate holders are sought by hatcherymen and they obtain full employment; in addition there are persons holding First Class Certificates who have reached a higher standard, but have not yet attempted to qualify for a Special Class Certificate, and these are also fully employed. A few sexers have given up work outside of their own hatcheries.

In the event of larger numbers of chickens being hatched next season, as a result of the appeal for more eggs for Britain, there will be room for a few more sexers.

Facilities for Learning Chick Sexing.

If there are sufficient applicants, classes of instruction in chick sexing are usually held in the autumn by one of the leading

sexers, who is sponsored by the Chick Sexers' Association. It should be realised, however, that in addition to attending classes, which extend over about three months, it is necessary to have intensive practice on some thousands of chickens before a candidate can expect to qualify for a certificate.

Good eyesight and deft fingers are essential to expertness in the art of chick sexing; thus youth is necessary for the highest efficiency. Few people over the age of 30 years when commencing have reached the highest standards, and many younger candidates have attended four to six examinations before qualifying.

It will, therefore, be seen that it is not easy to master the art of sexing—and the cost can be very considerable, especially if chickens have to be bought for practice.

Bacon Pig Carcase Competition—*continued from page* 654.

modern feeding methods, and a better understanding of the right stage of growth and development at which pigs should be slaughtered.

3. A number of low-grade carcases indicated that some farmers were still working with strains of pigs likely to produce carcases of poor type. In most cases it was clear that the pigs concerned had made poor use of the valuable feed consumed.

4. The wide range of quality of the entries illustrates the urgent need for the promotion of a comprehensive system of bacon pig carcase grading throughout the State, similar to those in operation in Denmark, Great Britain, Canada and New Zealand. As observed by the writer, the system in use in Canada works smoothly and efficiently. The New Zealand system is also understood to be most effective.

Conclusion.

The competition created increased interest amongst farmers in bacon carcase quality, and in the breeding and feeding related to it. The Australian Meat Board is to be congratulated on providing the prize money and the considerable clerical assistance required.

Refresher Courses for Ex-Servicemen.

No. 8 Refresher Course for Ex-servicemen will begin at Yanco Experiment Farm on 10th January, 1949. The course is filling up rapidly and ex-servicemen from all parts of the State have been enrolled.

Special instruction is being provided for those who wish to study irrigation farming. This will be in addition to normal specialist instruction in sheep, wool classing, dairying, pigs and horticulture.

This course will be followed by a further course beginning 14th March, 1949.

Ex-servicemen who are interested should communicate with the Deputy Co-ordinator of Rural Training, Department of Agriculture, Box 36A, G.P.O., Sydney.

Row-facing and Bunch-facing Cherries Prohibited.

THE attention of cherry-growers and others concerned is drawn by the Minister for Agriculture, Hon. E. H. Graham, M.L.A., to the regulation under the Plant Diseases Act which prohibits the practices of "row-facing" or "bunch-facing" in packing cherries. For their information the regulation is quoted in full:

"No person shall pack any cherries for sale or sell any cherries which have been packed in the manner customarily known as 'row-facing' or 'bunch-facing' or in any similar manner."

This regulation, pointed out the Minister, had been made during the war period in consequence of the shortage of labour. As that difficulty still continued, the regulation had been retained in force.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.)	120	13/11/48
Bradley, H. F., "Nardoo, Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	297	9/6/49
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park" Mumbil (Beef Shorthorns)	74	2/2/49
Limond Bros., Morisset (Ayrshires)	66	15/7/49
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	49	8/5/49
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	27/10/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	67	26/4/49
Yanco Experiment Farm (Jerseys)	91	14/10/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle	51	20/4/49
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale." Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell	33	28/7/49
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	14	14/5/49
Daley, A. J., Leaiands, Inverell	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell	34	5/4/49
Emu Plains Prison Farm	141	23/4/49
Fairbridge Farm School, Molong	33	9/4/49
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	27/7/49
Frizelle, W. J., Rosentein Dairy, Inverell	111	9/9/48
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	7	25/6/49
Grant, W. S., "Monkittee," Braidwood	24	10/5/49
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hart, K. H. Jersey Vale, Armidale	25	8/10/49
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale	11	12/4/49
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	17/6/49
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	40	20/11/48
McCosker, E., "Bannockburn Station," Inverell	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood	31	13/8/49
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
McMillan, N., Duval Road, Armidale	32	8/10/49
MacNamara, B. "Mount View," Cessnock	67	21/5/49
Marist Bros. College, Campbelltown	82	23/1/49
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/5c
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Mullholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	28	15/12/49
Police Boys Club, Kurrajong	12	5/7/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
Rolfe, A. E., "Avon Dale," Inverell	22	14/5/49
Rowlands, F. C., "Werribee," Waugoola	35	23/8/49
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	8	12/7/49
St. John's Hostel, Armidale	7	8/10/50

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills ...	29	11/6/49
St. Patrick's Orphanage, Armidale	12	8/10/50
St. Vincent's Boys' Home, Westmead ...	30	9/7/49
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	54	5/4/49
Tanner, F. S., Dural Rd., Armidale	42	8/10/49
Tombs, E. S., Box 76 P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49
Tombs, R., Harlwood, Armidale	37	8/10/49
Tosh, W. K., "Balgownie," Armidale ...	15	8/10/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48
Von Frankenberg, F. E. "Spring Hills," Camden	68	12/12/48
Waddell, W., "Afton," Oakwood Rd., Inverell	127	5 7/49
Waters, A., Marsh Street, Armidale	2	8/10/49
Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	98	28/11/48
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., "Birida," Armidale ...	39	12/4/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

"Foul Brood and its Origin."

A Warning to Beekeepers.

"FOUL Brood and its Origin," a publication reprinted from the British *Bee Journal*, and which expresses the personal opinions of a Mr. E. S. Mayne, has been sent by the author to officers of the Apiary Branch of the Department of Agriculture, to the Editor of the *Australasian Beekeeper* and to some beekeepers.

The author of this article proposes to ignore the recognised fact that American Foul Brood is caused by a specific disease agent (*Bacillus larvae*), and argues that it is the result of thundery weather on brood which has been killed by mechanical injury or chilling. This is certainly not the case, and beekeepers are urged to ignore Mr. Mayne's recommendations for the good reason that if they were followed, the disease would become more widely spread than it is at present.

A comprehensive outline of the cause, control, etc., of American Foul Brood has recently been published in two instalments in the *Agricultural Gazette* (September and October, 1948).

If this disease is to be kept at its present low level, or further reduced in quantity, it will be necessary to prevent spread of the spores of *Bacillus larvae* to uninfected apiaries, and for known infected apiaries to be carefully watched.

Any beekeeper who suspects the presence of American Foul Brood in his apiary is strongly urged to contact the Department immediately, and to send a sample of the suspect brood for expert diagnosis so that if the disease should be present, efficient control measures can be instituted without delay.—D. L. MORISON, Apiary Branch.

Lice in Sheep.

Infestation Detected at Flemington Saleyards.

OWING to the increase in the number of lice-infested sheep forwarded to Flemington Saleyards, the Department has again found it necessary to launch prosecutions against owners who have consigned such sheep to the yards for sale.

Sale of lice-infested sheep is illegal under section 20 (c) of the Stock Diseases Act. In a recent prosecution for this offence, a fine of £5 and costs of 8s. were imposed on a stockowner by the Magistrate at Parramatta Court.—DIVISION OF ANIMAL INDUSTRY.

Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Ayrshires)	46
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	30
Evans, C. A. & Sons, "Bong Bong," Moss Vale ...	58
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ..	121
Hawkesbury, Agricultural College, Richmond (Jerseys)	107
Hicks Bros. "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., "Nundi," Tarcutta (Red Poll)... ...	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	49
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	103
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabee," Quirindi...	75
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	200
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Von Nida, F. E., Wildes Meadow...	30
Wagga Experiment Farm, Wagga (Jerseys)	69
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	23
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm...	89
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	[illegible]
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	50
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale ...	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Gladesville Mental Hospital	7
Homer, A. T., Moorna Pastoral Co., Wentworth ...	14
Kenmore Mental Hospital	58
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	34
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	69
Salway, A. E., Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief of Division of Animal Industry.

State Elevators and Railways Set New Record in Wheat Handling.

"AT the close of the 1947-48 wheat season on 31st October, the carry-over of wheat amounted to about 14 million bushels," said the Minister for Agriculture, Hon. E. H. Graham, M.L.A. More than 87 million bushels of the record crop of 100 million bushels harvested last year had been received into the railway yards, and more than 73 million bushels had been moved to the seaboard, mills, etc. This figure was an all-time record achieved in very difficult circumstances.

"There can be no argument but that the Railway Authorities in this State have performed a magnificent task," added Mr. Graham.

"At the same time," said the Minister, "the New South Wales Grain Elevator System has done a remarkable job. The total capacity of the Grain Elevator System at one filling is approximately 33 million bushels of wheat. During last year's harvest 43 million bushels were received into the silos direct, and with the subsequent cutting in of bagged stacks the total is now well in excess of 52 million bushels. These figures also constitute an all-time record, the nearest approach being 39 million bushels during the 1939-40 harvest.

"At the commencement of the new season on 1st November, the silos were empty and ready to receive the crop."

"These records were achieved notwithstanding the unfavourable conditions experienced throughout the State during the harvest," continued Mr. Graham, "and I have no hesitation in saying that the successful operation involved in handling such a huge quantity of wheat under most difficult conditions was only made possible by the close collaboration which existed between the Australian Workers' Union, the Railway Department, the Department of Agriculture and wheatgrowers, and the loyal support given by all concerned during the movement of the wheat at the country silos, over the railway system and at the receival centres at the seaboard."

Brucellosis-free Herd Scheme (Swine)

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. O. "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B. Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Trichomoniasis in Cattle.*

Now Present in New South Wales.

TRICHOMONIASIS, a disease of cattle common to most countries of the world, has been diagnosed in New South Wales for the first time.

In making this statement, the Minister for Agriculture, Mr. Graham, said that this disease was due to infection of the breeding organs with a minute parasite, and was characterised by early abortion usually accompanied by a copious discharge of pus, and in some cases failure to breed.

"For some time past the presence of trichomoniasis has been suspected by departmental veterinary officers," said Mr. Graham, "but up to the present definite proof was not obtainable. Diagnosis depends upon microscopic examination of the discharges shortly after abortion. The organism is very fragile and is not easily found in preserved material. The disease is spread mainly by an infected bull at the time of service.

"Confirmation of the presence of this disease in New South Wales makes it all the more necessary for farmers to watch their cattle carefully and note any cases of early abortion. Trichomoniasis is scheduled under the Stock Diseases Act, and all stockowners are required by law to report the presence or suspected presence of it to their district stock inspector. In any case it is to the advantage of any farmer to obtain immediate advice if he has any reason to suspect the existence of the disease in his stock."

The Minister went on to say that the finding of trichomoniasis in the State was of considerable importance in connection with the development of artificial insemination, since there were records of the wide dissemination of the infection in semen taken from an infected bull.

"One of the reasons which influenced me to introduce the Stock Insemination Bill," said Mr. Graham, "was to ensure that semen be collected only from healthy bulls at insemination centres."